Unconfirmed Minutes

IEEE 802.3 CSMA/CD PLENARY
DFW Airport, TX
March 10 –14, 2003

MONDAY, MARCH 10, 2003

ADMINISTRATIVE MATTERS

(802.3 Secretary's Note: The minutes for the March 2003 802.3 Plenary are almost 300 pages long and include copies of all presentations and liaison materials. This document, therefore, will be terse and will not repeat material covered in the presentations. Please use the bookmarks to navigate to a particular attachment.

Mr. Robert Grow, Chair of 802.3 CSMA/CD Working Group called the meeting to order at 1:08PM. Mr. Grow introduced Mr. David Law, Vice Chair of 802.3, and Mr. Steve Carlson, Secretary of 802.3, and Task Force Chair of 802.3af. Mr. Howard Frazier, Chair of the 802.3ah Task Force was also introduced, along with Brad Booth, Chair of the 10GBASE-T Study Group, and Dan Dove, Chair of the 10GBASE-CX4 Study Group.

Mr. Grow then had the attendees stand and introduce themselves to the group.

Mr. Grow asked if there were any additions or corrections to the agenda. None were indicated.

MOTION
Approve the agenda <802.3 Opening Agenda>.

Moved: Brad Booth
Seconded: Tom Dineen

Agenda was passed by acclimation (voice vote).

Mr. Grow presented his Opening Report <802.3 Opening Report>.

MOTION

Approve the 802.3 minutes from Kauai.

M: Tom Dineen S: Lampson
PASSED by acclamation

Attendance Books

Mr. Carlson explained the operation of the Attendance books for new voters and established voters. Voters we cautioned that they would be subjected to public humiliation if they failed to follow the instructions.

Mr. Grow explained about paying the registration fees. Mr. Grow explained that your registration as a voter includes the 802.3-2002 CD-ROM, which includes 802.3ae. Mr. Grow forcefully explained that registration and the fee is mandatory. “We know who you are.”

Voters list postponed until later in the meeting.

Mr. Grow read the IEEE Patent Policy <IEEE Patent Policy> – Mr., Grow asked if anyone had any IP, and no one came forth. Mr. Grow reminded the group not to discuss territory, market share, price, ongoing litigation, threatened litigation, etc.

State of the Standard

Mr. Law reported on the state of the standard <State of the Standard>

Liaison Reports

External: TIA – TR-42 Chris DiMinico, “10GBASE Cable Modeling”
<TIA-TR42 to 802.3 Liaison Report>

SC25 WG3 Material - Alan Flatman
<Liaison Attachments>

FO2.2 - no report
SE6WG3 - no report
TR41.3 - no report
IETF - no report
802.11 - Letter from 802.11 <802.11 Liaison Request to 802.3 >
802.15 – no report
802.16 – no report
802.17 –no report
802.19. –no report
802.20 – no report

Letters

A large number of liaison letters were received. See the <Liaison Attachments> section.

TR-42 42.9 Industrial Communications – Mr. Carlson will lead ad hoc on crafting a response. Robert Muir, Geoff Thompson, Barry O’Mahoney and several others volunteered to participate in the ad hoc.

ACTION ITEM: David Law to investigate area to post liaison letters on the Web site.

IEEE1394- Request for use of 1G PHY @ 800MBPS for link. Mr. Law discussed issuing a code point for this and believes it must be done in the RAC. Mr. Tony Jeffree, the RAC Chair, should be consulted. Terry Cobb explained what 1394 is trying to do with this PHY.< 802.3 - 1394 Liaison>

Letter from 802.11 <802.11 Liaison Request to 802.3 > – Requesting 802.3af liaison regarding DTE Power. Mr., Grow and Mr. Carlson pointed out that 802.3af is in final sponsor ballot phase and would likely be approved by the SA in June. Therefore, it's too late in the process, and Mr. Grow will craft a polite refusal letter.

Maintenance

802.3aj – Mr. Law <802.3aj * Report>

The "Who is "Dave Boggs" question was asked of the newbies----with 100% packet loss. [1]☹

Interpretations

New requests <802.3 Interpretations Report>

1. Vertical eye closure penalty
   Piers Dawe – Presentation <Interpretation Request 1-03/03>
2. Pause priority resolution
3. Twisted pair model
4. 1000BASE-T test fixtures
5. 1BASE5 isolation
6. 10Mb/s and 100Mb/s repeaters
7. And left over from Kauai – Link Aggregation Control Protocol

802.3af DTE Power Opening Report – Steve Carlson

<802.3af TF Opening Report>

802.3ah EFM Opening Report – Howard Frazier

<802.3ah TF Opening Report>

802.3 10GBASE-CX4 SG Opening Report – Dan Dove

<802.3 10GBASE-CX4 SG Opening Report>

802.3 10GBASE-T SG Opening Report – Brad Booth

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[1] David Boggs is the co-inventor of Ethernet

<802.3 10GBASE-T SG Opening Report>

Room Assignments and TF Schedules
Mr. Law presented the room assignments.

Motion to adjourn by Tom Dineen at 5:11PM. Passed by acclimation.

IEEE 802.3 CSMA/CD PLENARY
DFW Airport, TX
March 10 –14, 2003

THURSDAY, MARCH 13, 2003

ADMINISTRATIVE MATTERS

Thursday, March 13, 2003 1PM – 5PM

Mr. Grow called the meeting to order at 1:04PM. The agenda was distributed to the group. Mr. Grow explained that the 2-11-02 Interpretation ballot is still open, and that Mr. Dineen is passing through the group soliciting votes.

Adding Link Sec at the end and Exec actions after Call for Patents modified the agenda.

Mr. Grow displayed the current 802.3 voters list. He then displayed the potential voters list and ran through it. Mr. Carlson ran through the attendance books and lectured people about signing.

Mr. Grow read the IEEE Patent policy <IEEE Patent Policy>
Mr. Grow read the IEEE anti-trust policy <IEEE Anti-Trust Policy>

Executive Items – PARS under consideration. Mr. Grow has asked if anyone wishes to comment. No comments were forthcoming.

802.3af DTE Power Closing Report – Steve Carlson
<802.3af TF Closing Report>

MOTION IEEE 802.3 requests that IEEE 802 SEC grant conditional approval per procedure 10 for submission of P802.3af to the June Standards Board meeting. M: S. Carlson S: T. Dineen Date: 3/13/2003 Y: 86 N: 0 A: 2 PASSES

Mr. Grow showed a letter to ITUT SG15 < ITUT SG15 >and went over it. He asked for a motion to send it out.

MOTION

Move to accept the draft letter to ITUT SG 15

M: Thompson S. Dineen

Y: 72 N: 1 A: 3

75% technical 1:45PM

PASSES

RULES CHANGE – David Law

Mr. Law requested a change to the agenda to discuss the 802.3 rules.

This change would allow attendance during Plenary week to count towards WG voting rights. <Rules Change>

There was discussion by Mr. Frasier as to the unworkability of this rule.

INTERPRETATIONS – David Law
<802.3 Interpretations Closing Report>

The ad hoc met Wednesday afternoon to work on the 2-11/02 D1.0 ballot.

#1 – no comments
#2 – no comments
#3 – no comments
#4 – no comments
#5 – revise name of dictionary
#6 – no comments

Pier Dawe gave a presentation on eye closure < Interpretation Request 1-03/03>

MOTION

IEEE 802.3 approves the proposed Interpretation response to the Interpretation requests 4-11/02, 1-03/03 through 6-03/03 as presented without the need for a 30 day letter ballot.

M: David Law S: Howard Frazier Tech 75%
PASSED Date:13-Mar-2003
Y: 67 N: 0 A: 1 Time: 2:24PM
MOTION

IEEE P802.3 authorises a Working Group recirculation ballot of Interpretation 2-11/02.
IEEE 802.3 authorises the IEEE P802.3 Interpretations Ad Hoc to conduct meetings and recirculation ballots as necessary to resolve comments received during the Working Group recirculation ballot of the response to Interpretation request 2-11/02

M: David Law S: Rich Brand Tech 75%
PASSED Date: 13-Mar-2003
Y: 68 N: 0 A: 1

Maintenance – David Law

<802.3 802.3aj Maintenance Closing Report>

MOTION

IEEE 802.3 accepts the resolution to all comments received in the Working Group recirculation ballot of P802.3aj Draft 2.1, and authorises the editor to generate Draft 3.0.
IEEE 802.3 requests that the P802 LMSC Executive Committee forwards IEEE P802.3aj Draft D3.0 for LMSC Sponsor Ballot.
IEEE 802.3 authorises the IEEE P802.3aj Task Force to conduct meetings and recirculation ballots as necessary to resolve comments received during the LMSC Sponsor Ballot.

M: D. Law S: H. Barrass Tech 75%
PASSED Date: 13-Mar-2003
Y: 62 N: 0 A: 2

802.3ah Ethernet First Mile (EFM) – Howard Frazier
< 802.3ah TF Closing Report>

802.3 10GBASE-CX4 SG – Dan Dove
< 802.3 10GBASE-CX4 SG Closing Report>

Mr. Dove made an 802.3 motion to accept the PAR, 5 Criteria and Objectives. Mr. Grow indicated that this should be divided per 802.3 practices to vote on each of the 5 criteria separately.

MOTION

Motion to divide into six separate votes: PAR, 5 criteria

Y: 29 N: 16 A: 50% procedural

MOTION PASSES 4:15pm

Criteria 1: Broad Market Potential

Y: 44 N:0 A: 4

MOTION PASSES 4:32PM

Criteria 2: Compatibility with IEEE Std. 802.3

Y: 47 N: 0 A: 3

MOTION PASSES 4:35PM

Criteria 3: Distinct Identity

Y: 41 N: 0 A: 2

MOTION PASSES 4:36PM

Criteria 4: Technical Feasibility

Y: 45 N: 0 A: 3

MOTION PASSES 4:42PM

Criteria 5: Economic Feasibility

Y: 46 N: 0 A: 0

MOTION PASSES 4:44PM

PAR approval

Changes as noted:
Item 10: 2003-11-21
Item 11: 2004-3-24

Y: 47 N: 0 A: 4

MOTION PASSES 4:56PM

MOTION

Without setting a precedent, accept the distribution of Working Paper version 3.1 as fulfilling 802.3 rule 2.8.2.
Upon PAR approval by the IEEE- SA Standards Board:
a) Convert working paper 3.2 (incorporating changes to 3.1 agreed to this week) to 802.3ak/D4.0
b) Release draft 4.0 for working group ballot and necessary recirculation ballots
c) Authorize 802.3ak task force interim meetings in order to resolve working group ballot and/or re-circulation comments

Moved: Dan Dove
Second: Jeff Cain
Y: 40 N: 3 A:10

MOTION PASSES 5:16PM

There was substantial debate on the propriety of doing this work without an approved PAR. Major reservations were expressed, but there is support for this project due to its focused nature and high quality work product.

The motion is not intended to set a precedent regarding the procedures of 802.3 and has been noted in the motion.

Motion to call the question: Passes with no opposition by voice.

802.3 10GBASE-T SG - Brad Booth
< 802.3 10GBASE-T SG Closing Report>

MOTION
Presubmit PAR 5 criteria in July <802.3ak PAR> <10GBASE-CX4 5 Criteria>
Based upon 10GBT SG Motion #1;
Move that 802.3:
– Authorize the 10GBASE-T Study Group to pre-submit their draft PAR and 5 Criteria to the 802 SEC for consideration at the July Meeting.
– Renew the charter of the 10GBASE-T Study Group for another meeting cycle.
Moved: B. Booth Seconded: D. Law
Technical (>75%)
802.3: Y: 49 N: 0 A: 3
MOTION PASSES 5:31PM

MOTION

802.3 Motion #2
• Move that:
The 802.3 Chair forward the following liaison request (properly formatted) to TIA TR42.
The 802.3 working group of the IEEE LAN-MAN Standards Committee has initiated a study group to investigate 10 Gigabit Ethernet operation on 4-pair 100 ohm Class D or better horizontal copper cabling as specified in ISO/IEC 11801 2nd edition. The investigation includes characterization of the Class D or better channel performance extending beyond the frequencies currently specified in ISO/IEC 11801 2nd Edition. The initial frequency range of interest for frequency characterization is: 1 MHz ϒ⇐ f ϒ⇐
625 MHz. In addition, the study group is investigating alien crosstalk impairments. The study group would appreciate the assistance of TR42 in this effort. The information provided will be utilized in simulation modeling to validate the technical feasibility.
• Moved: B. Booth on behalf of the 10GBASE-T Study Group
• Seconded: N/A
• Technical (>75%)
• 802.3: Y: N: A:
• Motion on amendment as above: PASSES by acclamation

The motion has been reproduced from the slide set verbatim due to the extensive use of color in the on-line editing. There was considerable discussion on issue of cable specification with the upshot that 802.3 should not be in the cable spec business. There is a sense that cable characterization is a very large project, with much work to be done.

MOTION TO AMEND

Change per color codes in slides, strike yellow text

M: DiMinico S: Simon

Technical 75%

Passes by voice acclamation

MAINTANENCE 802.3aj PAR

802.3 MOTION

Changed PAR per marked up PDF document supplied by Mr. Grow

< 802.3aj Maintenance PAR>

M: Thatcher S: Barass

Technical 75%

Y: 31 N: 0 A:0
MOTION PASSES

Industrial Ethernet

MOTION to postpone TR-42 liaison letter until July passes by voice acclimation after much discussion of draft letter.

Liaison to 802.1- Jonathan Thatcher
< 802.1 to 802.3ah Liaison>

MOTION

Motion: Liaison to IEEE 802.1

To: Tony Jeffree, Chair IEEE 802.1
Whereas the IEEE P802.1ab (Link Discovery) project has aspects that may overlap with aspects of IEEE P802.3ah, Clause 57 (EFM's OAM), we request the 802.1 Working Group to review Drafts 1.4 of Clause 57 and provide feedback prior to EFM's June Interim Meeting or sooner.

Mover: Jonathan Thatcher Seconder: David Law
Motion Passes by acclamation

There was discussion about the meaning of the motion and timescale. The motion recorded reflects amendments made from the floor.

802 SEC Link Security - Dolors Sala
< 802 Link Security SEC SG Closing Report>

Where will Link Sec be positioned after it moves out of the Exec? 802.1 has offered to host the project.

Motion adjourn at 6:24PM

IEEE 802.3 Working Group Opening Plenary 10 March 2003

Robert M. Grow
Chair, IEEE 802.3 Working Group
Principal Architect, Intel Corporation
bob.grow@ieee.org

Introductions & Agenda

- 802.3 Web Site – www.ieee802.org/3
- Officers
  - 802.3 Chair: Bob Grow (bob.grow@ieee.org)
  - 802.3 Vice Chair: David Law (david_law@3com.com)
  - Secretary & 802.3af DTE Power: Steve Carlson (scarlson@esta.org)
  - 802.3ah EFM: Howard Frazier (millardo@dominetsystems.com)
  - 10GBASE-CX4: Dan Dove (d.dove@hp.com)
  - 10GBASE-T: Brad Booth (bradley.booth@intel.com)
- Attendee Introductions
- Approve agenda

Documents

- 802.3aj/D1.2, Maintenance #7, WG recirculation ballot
- 802.3af/D4.1 Sponsor recirculation ballot
- 802.3ah/D1.3 Task Force review
- 10GBASE-CX4 working paper distributed for review for possible progression to WG ballot
- Some copies of 2003 CD-ROM still available
- 802.3 minutes were posted to the web site
  - Approval of minutes

Attendance

- Membership requirements (acquiring or retaining 802.3 voter status)
  - 75% attendance at 2 of last 4 plenary meetings (an interim may be substituted for one plenary)
  - Request to become member
  - Maintain valid contact information (on stds-802-3 reflector)
  - Participate in WG ballots
- Attendance books
  - Sign in each day, only for that day, and only for yourself
  - Two books
    - Members and observers (signed in during last year)
    - New attendees & update contact information
- Review membership lists

Interim TF & SG meetings held

- Roseville, 16-17 Dec 2002
  10GBASE-CX4
- Vancouver, 6-10 Jan 2003
  802.3af, 802.3ah, 802.3aj,
  10GBASE-CX4, 10GBASE-T
- Milpitas, 28-29 Jan 2003
  802.3af
- Raleigh, 14-15 Feb 2003 –
  10GBASE-CX4

803.3 project ballots

- Sponsor Ballots:
  - 802.3af/D4.0 – Initial Sponsor ballot
  - 802.3af/D4.1 – 1st Sponsor recirculation
- Working Group Ballots:
  - 802.3aj/D2.0 – Initial WG ballot
  - 802.3aj/D2.1 – 1st WG recirculation
  - Interpretation 2-11/02 – WG ballot

December Standards Board

- No 802.3 projects considered
- Proposed changes to interpretations process
  - Sponsor based interpretation process
    - Balance requirement for Interpretations Group
    - Group classifies: 10-30 days (formal/explanation)
    - Group drafts response: within 6 months
    - Optional requestor review: 40 days
    - 75% approval by sponsor vote: vague procedure
  - Would require major change to 802.3 process
  - 802.3 Chair submitted comments to ProCom

March Standards Board

- 802.3aj PAR revision presubmitted
- 802.3ak PAR presubmitted
- ProCom interpretations process

SEC Report

- Rules Changes
  - Unpaid Attendees: clarify loss of membership, extend to interim meeting
  - Sponsor Ballot Periods: minimum 30 day initial, 15 day recirculation
  - Appeals: formally defines the 802 appeals process
  - Terminology: usage of “Executive Committee” and Sponsor Executive Committee”

SEC Report (continued)

- Funding changes for the SA, e.g.:
  - Higher dues
  - Sponsor ballot fees
  - Project initiation fees
- Location of Link Security ECSG within 802.1: motion postponed to Friday
- 802.1F administrative withdrawl

SEC Report (continued)

- Chairs meetings:
  - Conformance claims to drafts
  - SA position statements
  - Project initiation fees
  - Get IEEE 802 budget
  - 802 Task Force

Tutorials & CFIs

- Monday Evening
  - Noon – IEEE-SA Overview
  - 6:30 Link Security – Bridging
  - 7:30 Link Security – EPONs
  - 8:30 Link Security – 802.10
- Tuesday Evening
  - 6:30 802 Handoff Mechanism
  - 7:30 Basic Principles of UWB for Low Power & Location Awareness
  - 9:00 Basic Principles of Mesh Networking for Location Awareness and Self-Management
- No 802.3 Call for Interest

IEEE-SA Standards Board Bylaws on Patents in Standards

6. Patents

IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard. This assurance shall be provided without coercion and prior to approval of the standard (or reaffirmation when a patent becomes known after initial approval of the standard). This assurance shall be a letter that is in the form of either

a) A general disclaimer to the effect that the patentee will not enforce any of its present or future patent(s) whose use would be required to implement the proposed IEEE standard against any person or entity using the patent(s) to comply with the standard or

b) A statement that a license will be made available without compensation or under reasonable rates, with reasonable terms and conditions that are demonstrably free of any unfair discrimination

This assurance shall apply, at a minimum, from the date of the standard's approval to the date of the standard's withdrawal and is irrevocable during that period.

Inappropriate Topics for IEEE WG Meetings

- Don't discuss licensing terms or conditions
- Don't discuss product pricing, territorial restrictions or market share
- Don't discuss ongoing litigation or threatened litigation
- Don't be silent if inappropriate topics are discussed… do formally object.

If you have questions:
contact the IEEE Patent Committee Administrator at patcom@ieee.org

Project Authorization Requests

- 802.16.3 – 10-66 GHz Radio Conformance Tests
- 802.11m – Technical corrections and clarifications
- 802.11n – Enhancements for Higher Effective Throughput
- 802.3aj (revision) – Maintenance #7
- 802.3ak – 10GBASE-CX4

Continuing Agenda

- State of the Standard (Mr. Law)
- 802.3 Operating Rules (Mr. Law)
- Liaison Reports
- Task Force & Study Group Reports
  - 802.3aj Maintenance #7 (Mr. Law)
  - Interpretations (Mr. Law)
  - 802.3af DTE Power via the MDI (Mr. Carlson)
  - 802.3ah Ethernet in the First Mile (Mr. Frazier)
  - 10GBASE-CX4 (Mr. Dove)
  - 10GBASE-T (Mr. Booth)
- Plan for the Week (Mr. Law)

IEEE 802.3 CSMA/CD WORKING GROUP   Draft AGENDA

See our web site: http://www.ieee802.org/3

10 March 2003, DFW, Texas
Start at 1:00 PM

1300, MONDAY, 10 March

Administrative Matters .... Bob Grow

- Welcome, Introductions and General Announcements
- Agenda, review and revise as needed
- Document distribution
- Approval of Minutes: 11/02 Kauai meeting
- Attendance, address list/e-mail list maintenance
- Review of Voting Membership
- Announce WG activities since Vancouver
- Standards Board Report
- Executive Committee Report & Action Items
- Call for Patents
- PARs under consideration this week (Comments by Noon Wednesday)
- State of the Standard and the Operating Rules of 802.3 .... David Law

Liaison Reports

- External Liaisons: TR-42, SC25/WG3, FO2.2, SC6/WG3, TR-41.3.4, IETF
- Internal Liaison Reports: 802.1, 802.11, 802.15, 802.16, 802.17, 802.18

Task Force Reports

- P802.3aj, Maintenance #7 .... David Law
  - Status of 802.3aj draft
  - Update/Status of maintenance process
- Interpretation requests .... David Law
  - 2-11/02 Ballot
  - Preview of new interpretation requests
  - Update/Status of interpretation process
- P802.3af, Task Force (DTE Power via MDI) .... Steve Carlson
  - Update/Status of the project
  - Plans for this week

1500-1520   BREAK

Task Force and Study Group Reports

- P802.3ah Task Force (Ethernet in the First Mile) .... Howard Frazier
  - Update/Status of the project
  - Plans for this week
- 10GBASE-CX4 Study Group .... Dan Dove
  - Update/Status of the project
  - Plans for this week
- 10GBASE-T Study Group .... Brad Booth
  - Update/Status of the project
  - Plans for this week
- Room Assignments and Task Force Schedules .... David Law

IEEE 802.3 VOTERS

(219) as of 3/6/2003

Abedmamoore,
Alavi, Reza
Alderrou, Don
Anderson, Tony
Arnold, Brian
Artman, Doug
Atias, Ilan
Bar-Or, Shahar
Barrass, Hugh
Barrett, Bob
Bartur, Meir
Beaudoin, Denis
Beck, Michaël
Beili, Edward
Bemmel, Vincent
Bennett, Mike
Berman, David J.
Bhatt, Vipul
Booth, Brad
Bottorff, Paul
Braga, Al
Brand, Richard
Brown, Benjamin
Brown, Kevin
Buckmeier, Brian
Burton, Scott
Busse, Robert
Bynum, Roy
Cain, Jeff
Cam, Richard
Carlson, Steve
Carnine, Dan
Chang, Justin
Chen, Xiaopeng
Chow, Jacky
Claseman,
Cobb, Terry
Coleman, Doug
Cook, Charles I
Cross, Richard
Cullin, Chris
D'Ambrosia, John
Daines, Kevin
Dallesasse, John
Darshan, Yair
Dawe, Piers
Di Minico, Chris
Diab, Wael
Dineen, Thomas
Dove, Dan
Dudek, Mike
Dwelley, David
Easley, J. Craig
Eckert, Edward J.
Effenberger,
Egan, John
Eisler, George
English, Kent
Ewen , John F.
Fanfoni, Sabina
Figueira, Norival
Finch, Robert G
Flatman, Alan
Ford, Brian
Fraser, Roger
Frazier, Howard
Fujimoto, Yukihiro
Gaglianello,
Gaither, Justin
Gentry, Denton
George, John
Goldis, Moty
Graham, Rich
Gray, C. Thomas
Grow, Robert M.
Gummalla, Ajay
Gustafsson,
Gyurek, Russ
Haas, Steven
Haddad, Tariq
Haddock, Stephen
Haran, Onn
Healey, Adam
Heckroth, Jim
Hiironen,
Hinrichs, Henry
Huynh, Thong
Ip, Baldwin
Jackson, Steve
Jacobsen, Krista
Jetzt, John
Jiang, Wenbin
Jones, Chad
Jonsson, Ulf
Jørgensen,
Kabal, David
Kaku, Shinkyo
Kaplan, Hadriel
Karam, Roger
Kaufman, Dave
Kenny, John J.
Kim, Chan
Kim, Jin H.
Kimpe, Marc
King, Neal
Kolesar, Paul
Lackner, Hans
Langston, Daun
Law, David
Le Goff, Yannick
LeCheminant,
Lehr, Amir
Leshem, Amir
Limb, John O.
Lindsay, Tom
Ling, Stanley K
Lynskey, Eric R.
MacLeod, Brian
Maislos, Ariel
Marris, Arthur
Martin, David W.
Mathey, Thomas
McCammon, Kent
McCormack,
Mizrahi, Jacob
Moseley, Simon
Muir, Robert
Muller, Shimon
Murphy, Denis
Murphy, Thomas
Nadeau, Gerard
Naganuma, Ken

Naidu, Hari
Nakamura, Karl
Nazari, Nersi
Nedellec, Erwan
Nguyen, Trung
Nikolich, Paul
Noseworthy, Bob
O'Mahony, Barry
Obara, Satoshi
Oksman, Vladimir
Pannell, Don
Papandrea,
Parsons, Glenn
Peng, Y. Lisa
Pepeljugoski,
Pesavento, Gerry
Pietilainen, Antti
Plunkett, Timothy
Posthuma, Carl R.
Quackenbush,
Quilici, Jim
Quinn, Patrick W.
Quirk, John
Rabinovich, Rick
Rahn, Jurgen
Raman, Naresh
Rasimas, Jennifer
Reintjes, Maurice
Remein, Duane
Rennie, Lawrence
Rezvani, Behrooz
Rogers, Shawn
Romascanu, Dan
Ross, Floyd
Rubin, Larry
Rundquist, Ron
Sala, Dolors
Sambasivan, Sam
Sankey, Mark
Saracino, Concita
Sasaki, Akira
Savara, Raj
Say-Otun, Sabit
Schindler, Fred
Schwartz, Peter
Sendelbach, Lee
Seto, Koichiro
Shah, Sunil
Shain, Vadim
Shohet, Zion
Simon, Scott
Soffer, Ran
Song, Jaeyeon
Song, Jian
Sorbara, Massimo
Soto, Walt
Squire, Matthew
Stanley, Patrick H.
Starr, Tom
Stuart, Richard
Suzuki, Hiroshi
Swanson, Steve
Szostak, Tad
Tate, Mike
Tatum, Jim
Thaler, Pat
Thatcher, R.
Thirion, Walter
Thompson,
Thorne, David
Tolley, Bruce
Turner, Edward
Twu, Bor-long
van Doorn,
Vergnaud, Gérard
Wang, Chiung
Warland, Tim
Warren, Jeff
Wei, Dong
Weissberger, Alan
Williamson, Erica
Won, King
Wurster, Stefan
Yang, Steven
Yoshihara,
Zagalsky, Nelson
Zona, Bob

802.3 POTENTIAL VOTERS NOVEMBER, 2002

94 Qualify 3/6/2003

If you wish to become a voter you must say so during THAT agenda item in the 802.3 Plenary Meeting.
This will be done very early in the meeting Monday PM and Thursday PM.

Abaye, Ali
Algie, Glenn
Anderson, Stephen D.
Bachand, Gerard E
Baldman, Andy
Barnea, Eyal
Berglund, Sidney
Blakey, Samantha
Blauvelt, Hank
Bluvstein, Ilan
Brandner, Rudolf
Chen, Raymond
Courtney, Steve
Cravens, George
deBie, Michael
Delgoshen, Udi
Drory, Alon
Freedman, Martin G
Freitag, Ladd
Furlong, Darrell
Gerhardt, Floyd
Ginis, George
Golob, Larry
Haile-Mariam, Atikem
Hansen, Chris
Hemmah, Steven
Hickey, Tony
Hirth, Ryan
Horvat, Michael
Hyer, David W.
Ikeda, Hiroki
Jaffa, Brent
Jain, Raj
Johnson, Richard V
Joiner, Steve
Jones, Stephen K.
Kalluri, Sudhakar
Kamat, Puru
Khansani, Masond
Khermosh, Lior
Kim, Ajung
Kim, Su-Hyung
Kleiner, Norbert
Kramer, Glen
Kutzavitch, Walter
Lam, Jackson
Lavasani, Javad
Lawrence, Eric
Lee, Ying
LIM, Seyoun
McSweeney, Brian
Miao, Tremont
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Mickelsson, Hans
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Vicini, Luca
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Wong, David
Ye, Yinghua
Yoo, Tae-Whan
Yoon, Chong Ho
Yoshida, Shin
Yu, Hong
Zhaohui, Cai

IEEE 802.3 VOTERS IN PERIL **March, 2003** (26) 3/6/2003

If your name is on this list AND you wish to remain an 802.3 Voter you need to make sure that you sign the book every day that you are in 802.3.

"Voter in Peril" means that the persons listed will not be voters after this meeting unless they meet the "full attendance" requirement for this meeting. That is, they sign-in at least 3 of the 4 days.

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D'Ambrosia, John
Figueira, Norival
Fraser, Roger
Gentry, Denton
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Starr, Tom
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Turner, Edward
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UPDATE CONTACT INFORMATION

(The following Members and Observers are believed to have invalid email addresses (repeated bounces). Please update or verify contact information.)

45 People

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Bisberg, Jeff E.
Burke, Bob
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Chan, James
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Furlong, Darrell
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Golob, Larry
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Harai, Hideyuki
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Jaffa, Brent
Kadowaki, Makoto
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Lackner, Hans
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Madsen, Tove
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Mckay, Nick
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Nishi, Hiroaki
Noren, Bud E
O'Neal, Ron
Palm, Torbjorn
Payne, John
Poulain, Michel
Ribeiro, Carlos A R
Rooke, Sterling
Stiscia, Jim
Stoddart, Dean M
Szerenyi, Laszio
Takagi, Kazuo
Thepot, Frederic
Tusiray, Bulent
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Welch, Jim
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Wong, David
Woodruff, Bill
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Ygdal, Naouri
Yorks, Jason
Yoshida, Shin

PAR FORM

PAR Status: Revision of Amendment
PAR Approval Date: 0000-00-00
PAR Signature Page on File: Yes
Review of Standards Development Process: No

1. Assigned Project Number: 802.3aj

2. Sponsor Date of Request: 2003-02-03

3. Type of Document: Standard for

4. Title of Document:
Draft: Information Technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) access method and physical layer specifications Maintenance #7

5. Life Cycle: Full Use

6. Type of Project:
6a. Is this an update to an existing PAR? Yes
If Yes: Indicated PAR number/approval date: 802.3aj - 2002-06-13
If Yes: Is this Project in Ballot now? No
6b. The Project is a: Amendment to Std 802.3-2002 and 802.3ae-2002

7. Contact Information of Working Group:
Name of Working Group: 802.3
Name of Working Group Chair: Robert M Grow
Telephone: 858-391-4622 **FAX:** 858-391-4659
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8. Contact Information of Official Reporter (If different than Working Group Chair)
Name of Official Reporter: (if different than WG contact)
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Email:

9. Contact Information of Sponsoring Society or Standards Coordinating Committee:
Name of Sponsoring Society and Committee: Computer Society Local and Metropolitan Area Networks
Name of Sponsoring Committee Chair: Paul Nikolich
Telephone: 857-205-0050 **FAX:** 781-334-2255
Email: p.nikolich@ieee.org
Name of Liaison Rep. (If different than Sponsor Chair):
Telephone: **FAX:**
Email:

10. The Type of ballot is: Individual Sponsor Ballot
Expected Date of Submission for Initial Sponsor Ballot: 2003-03-24

11. Fill in Projected Completion Date for Submittal to RevCom: 2003-07-17
Explanation for Revised PAR that Completion date is being extended past the original four-year life of the PAR:

12. Scope of Proposed Project:

The scope of this project is maintenance changes to the currently approved IEEE Std 802.3, including its approved amendments and corrigenda.

13. Purpose of Proposed Project:

The purpose of this project is to add accumulated maintenance changes submitted through the ongoing IEEE 802.3 Working Group maintenance process as described at http://www.ieee802.org/3/maint/index.html.

14. Intellectual Property:

Sponsor has reviewed the IEEE patent policy with the working group? Yes
Sponsor is aware of copyrights relevant to this project? No
Sponsor is aware of trademarks relevant to this project? No
Sponsor is aware of possible registration of objects or numbers due to this project? Yes

15. Are you aware of other standards or projects with a similar scope? No

Similar Scope Project Information:

16. Is there potential for this standard (in part or in whole) to be submitted to an international organization for review/adoption?: Yes

If yes, please answer the following questions:

Which International Organization/Committee? IEC TCJTC1 SC6 WG3

International Contact Information?	Robin Tasker CLRC +44-1925-603758 R.Tasker@dl.ac.uk

17. Will this project focus on Health, Safety or Environmental Issues? No

18. Additional Explanatory Notes: (Item Number and Explanation)

The maintenance changes included in this project, include maintenance changes to both IEEE Std 802.3-2002 and its approved ammendment IEEE Std 802.3ae-2002. This revised PAR removes any ambiguity on scope, references both documents, and the revised purpose addresses a request from NesCom (when the PAR was originally approved) to reference our ongoing maintenance process in future maintenance submissions. Discussion with IEEE staff also indicates the need to change to an ammendment since the maintenance requests do include small editorial additions to the standard.

IEEE Project 802.3 Working Group Standards Status March 10th, 2003

ISO/IEC approved

ISO/IEC 8802-3:2000

ANSI/IEEE Std. 802.3-2002 Published 8-Mar-02
Published as 3 Books (Sections)

Section 1	Section 2	Section 3
Clauses 1 to 20 Annexes A to H	Clauses 21 to 32 Annexes 22A to 32A	Clauses 34 to 43 Annexes 36A to 43C
CSMA/CD Overview MAC PLS/AUI 10BASE5 MAU 10BASE2 MAU 10BROAD36 MAU 10BASE-T MAU 10BASE-F MAUs 10Mb/s Repeater 10Mb/s Topology	100Mb/s Overview MII 100BASE-T2 100BASE-T4 100BASE-TX 100BASE-FX 100Mb/s Repeater 100Mb/s Topology	1000Mb/s Overview GMII 1000BASE-X AutoNeg 1000BASE-SX 1000BASE-LX 1000BASE-CX 1000BASE-T 1000Mb/s Repeater 1000Mb/s Topology
1BASE5 DTE & MAU Mgmt Repeater Mgmt	MAC Control Auto Negotiation Management	Link Aggregation

Maintenance #6 changes

ANSI/IEEE approved

.3
Policy and Procedures
Approved Nov-97

Network Systems Tutorial
Published Jun-95

IEEE Std. 1802.3-2001
Conformance Test 10BASE-T
Published 19-Oct-01

IEEE Std. 802.3ae-2002
10Gb/s Ethernet
1000Mb/s Overview
XGMII **XAUI**
XBSI **MDIO**
10GBASE-LX4
10GBASE-ER/LR/SR
10GBASE-EW/LW/SW
Published 30-Aug-02

802.3 WG in process

.3af
DTE Power via MDI Task Force
(S. Carlson)
Sponsor Recirc Ballot
Closed 2-Mar-03

.3aj
Maintenance #7
(D. Law)
WG Recirc Ballot
Closes 11-Mar-03

.3ah
Ethernet in the First Mile Task Force
(H. Frazier)
PAR approved
Sept-01

802.3 WG new work items

10GBASE-CX4
Study Group
(D. Dove)

10GBASE-T
Study Group
(B. Booth)

Status update

- IEEE Std. 802.1F ‘Management architecture’
  - SEC approved Admin withdrawal Nov. 2002
  - Basis of IEEE Std. 802.3 Management
  - Also in 802 5 Criteria (6.2 Compatibility)
  - Decision may be reconsidered a Friday SEC
- ISO/IEC 8802-3
  - Fast track ballot (6 months) approved at ISO/IEC/JTC1/SC6 meeting in London 21St February 2003.
    - Editor: Geoff Thompson
    - Title: CSMA/CD Revision consolidating 10G Ethernet (802.3+802.3ae)

IEEE 802.3
Rules Report

March 10th, 2003
DFW Airport, TX

David Law

Rules change procedure

- 1 Proposed Rules Changes received
- Attendance credit for Study Groups meetings in subclause 4.4.1 of rules
  - Meeting to discuss the change this week
  - Change pre-circulated prior this next plenary
  - Vote held at next closing 802.3 plenary, either:-
    - **Reject**
    - **Approve**
    - **Send out to Working Group Letter Ballot**

Proposed Rules Revision 1-03/03

Proposed revision

In subclause ‘4.4.1 Study Group Meetings’, replace the current text which reads:

> These do not count towards 802.3 WG voting rights.

with:

> Participation at a duly constituted Study Group meeting during a Working Group Plenary meeting will count towards the 75% presence at a Working Group meeting. All other Study Group meetings do not count towards 802.3 WG voting rights.

Proposed Rules Revision 1-03/03

Rational for Proposed Rules Revision

During a plenary meeting you should be able to attend a study group meeting and that attendance should still count toward being present at a plenary meeting since these meetings are held during normal task group times. Since the study group is of limited duration, may or may not result in a task group, and does not have to be co-located with an interim task group meeting; interim or adjunct meetings need not count. This should not require a change in the IEEE 802 operating rules.

IEEE 802.3 Operating Rules

802.3 Operating Rules URL:

http://www.ieee802.org/3/rules/index.html

Web site Provides

802.3 Operating Rules in pdf

Revision history

ISO/IEC SC25/WG3 Meeting

Wellington, New Zealand: 10-14 Feb 2003

- Structured Cabling Systems -

report for IEEE 802 by Alan Flatman

27 Experts 12 Nations

Highlights

- residential cabling issued as FCD
- industrial cabling well underway
- draft cabling guide for wireless APs + remotely-powered devices
- statement on 10GBASE-T cabling

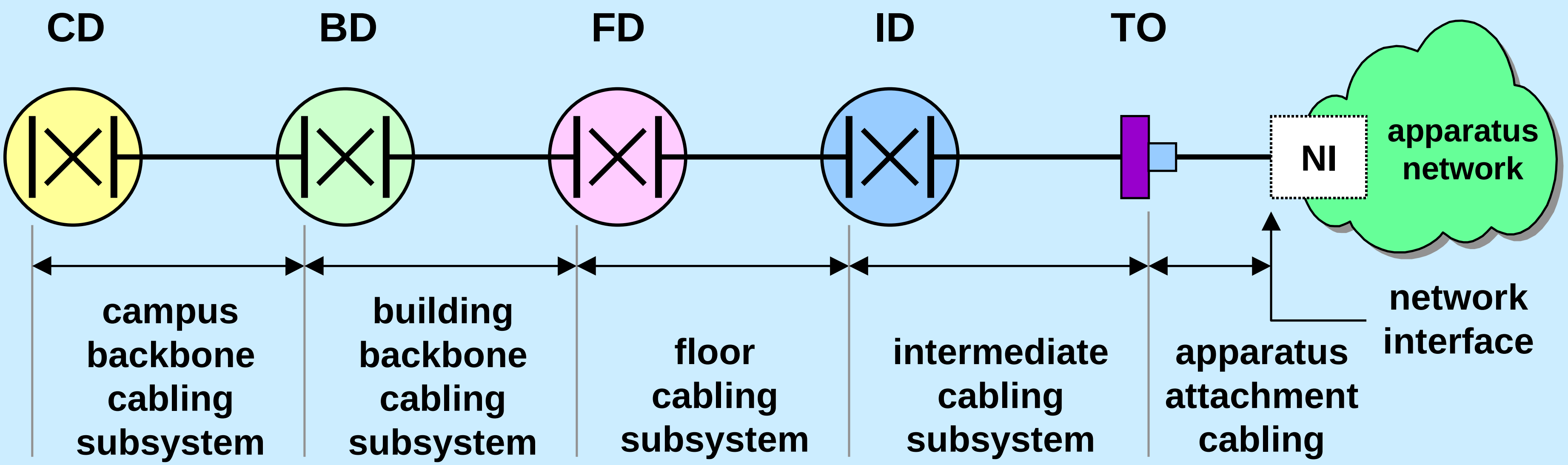
Industrial Premises Cabling

- development co-ordinated with others
  - » ISO/IEC, CLC, TIA cabling groups
  - » IEC cable and connector groups
  - » IEC Process Control System group
  - » ODVA (Open DeviceNet Vendors' Association)
  - » IAONA (Indus Autom'n Open Network Alliance)
- common set of fundamentals agreed
- document structure well established
- document clause editors appointed
- first full draft spec expected by 2Q04

Industrial Premises Cabling - Scope

- **industrial environment IT + process control**
- **new architectures for *industrial apparatus***
- **new components for harsh environments**
- **spec oriented towards balanced cabling:**
  - » **to support low-cost, low-freq process control**
  - » **remote powering for process control systems**
- **max channel increased from 2km to 10 km**
  - » **OF-5000/OF-10000 created for SMF 1/10GBE**
  - » **OS-2 created with 0.4db/km (OS-1= 1db/km)**

Industrial Premises Cabling - Structure



Environmental Classification

	Class I (light commercial)	Class II (light industrial)	Class III (heavy industrial)
Mechanical	M_1	M_2	M_3
Ingress (IP rating)	I_1	I_2	I_3
Climatic	C_1	C_2	C_3
Electromagnetic	E_1	E_2	E_3

- environmental classes may be mixed (eg $M_1I_2C_3E_2$)
- MICE classes may vary along a single channel
- MICE requirements may be fulfilled by component choice and channel requirements met “by design”

Cabling for Wireless Access Points and Remotely-Powered Devices

- guidance on placement of outlets for WAPs & remotely-powered devices
- initial draft created for Wireless APs
  - » 802.11, 11a, 11b, Bluetooth, DECT
  - » Infra-Red to be addressed later
- other types of device to be added later
  - » cameras, microphones, displays, sensors
- issued as a draft technical report (TR)
- sent to IEEE 802 for review + comment
  - » 802.3af, 802.11, 802.15

Future Meetings

Residential Cabling	12-14 May 2003	Helsinki, Finland
Industrial Cabling	29-31 May 2003	Alexandria, VA
ISO/IEC SC25 WG3	15-18 Sep 2003	Switzerland
ISO/IEC SC25 Plenary	19 Sep 2003	Switzerland

Questions?

ISO/IEC JTC 1/SC 25 N 835

Date: 2003-02-20

Replaces ISO/IEC JTC 1/SC 25 N n/a

ISO/IEC JTC 1/SC 25
INTERCONNECTION OF INFORMATION TECHNOLOGY EQUIPMENT
Secretariat: Germany (DIN)

DOC TYPE:	**PDTR Type 2**
TITLE:	**PDTR ISO/IEC XXXXX: Information technology - Customer premises cabling for wireless access points**
SOURCE:	**SC 25/WG 3**
PROJECT:	**25.03.08**
STATUS:	**Based on a decision of SC 25/WG 3 at Wellington, New Zealand, this PDTR is distributed for voting at the same time as the appropriate proposal for new work is distributed with SC 25 N 834 in accordance with JTC 1 Directives 12.2.7. Should the NWIP fail this PDTR and the comments received will be cancelled.**
REQUESTED ACTION:	**ACT**
DUE DATE:	**2003-05-31**
MEDIUM:	**Open**
No of Pages:	18 (including cover)
NOTE	Electronically this document consists of three files: 25N835.pdf, 3N835v.html, and 25N835x.doc

DISTRIBUTION:

P- O- and L-Members of SC 25
IEC Central Office, Mr Barta
JTC 1 Secretariat, Mrs Rajchel
DKE, Hr Wegmann

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Home page: " http://sc25.iec.ch/"

PDTR ISO/IEC XXXXX: Information technology - Customer premises cabling for wireless access points

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Information technology – Customer premises cabling for wireless access points
Draft 1.0

Foreword

1) ISO (the International Organisation for Standardisation) and IEC (the International Electrotechnical Commission) form the specialised system for worldwide standardisation. National bodies that are members of ISO or IEC participate in the development of International Standards and Technical Reports through technical committees established by these organisations to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organisations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards and Technical Reports adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard or Technical Report requires approval by at least 75% of the national bodies casting a vote.

3) Technical Report ISO/IEC TR XXXXX, Information Technology – Customer premises cabling for wireless access points, was prepared by the Joint Technical Committee ISO/IEC JTC 1/SC 25, Interconnection of Information Technology Equipment.

4) This Technical Report has taken into account requirements specified in application. It refers to International Standards for components and test methods whenever an appropriate International Standard is available.

5) Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

This document is being issued as a Technical Report Type 2 (according to 15.2.2 of the ISO/IEC JTC 1 Directives) as the subject in question is still under technical development and as a “prospective standard for provisional application” in the field of Information Technology Infrastructure because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an “International Standard”. It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the IEC Central Office. A review of this Technical Report will be carried out not later than 3 years after its publication with the options of: extension for another 3 years; conversion into an International Standard; or withdrawal.

Introduction

This document specifies the use of generic cabling for customer premises, as specified in international standard ISO/IEC 11801 for connection to wireless access points. It is intended to guide new installations and renovations. The customer premises may encompass one or more buildings or may be within a building that contains more than one enterprise.

This Technical Report specifies an ISO/IEC compliant implementation methodology that enables connection to ICT equipment that is specifically deployed to provide a grid of wireless coverage areas within buildings. The cabling may be installed prior to the selection of specific equipment or selection of the wireless application to be used.

International standard ISO/IEC 11801 specifies a structure and performance requirements for cabling subsystems that support a wide range of ICT applications. It provides appropriate equipment interfaces to the cabling infrastructure in equipment rooms, telecommunications rooms and work areas.

A growing number of enterprises employ equipment at the “edge” of the network that rely on both physical connections to the cabling infrastructure at the work area, while also having the ability to maintain untethered network access at other locations. This Technical Report was created because the infrastructure specified in cabling standard ISO/IEC 11801 does not specifically cover infrastructure for connections to wireless access points. Supplementary information is provided here on the number of outlets and outlet placement for wireless access points that may optionally receive both power and information transfer through the IT cabling.

This Technical Report specifies a cabling system infrastructure based upon balanced and optical fibre cabling that provides:

- users with requirements for a supplemental cabling infrastructure that enables reliable deployment of wireless ITC equipment without the costs associated with the installation of additional IT or mains power cabling,
- users with a flexible cabling scheme such that changes to the wireless access points are both easy and economical;
- building professionals (for example, architects) with guidance for accommodating cabling before specific requirements are known i.e. in the initial planning either for construction or refurbishment;
- industry and applications standardisation bodies (e.g. ITU-T, ISO/IEC JTC 1/SC 6, ISO/IEC JTC 1/SC 25/WG1, IEC TC 100) with a cabling system that supports current products and provides a basis for future product development;
- users, designers, and manufacturers of wireless access points with advice on interfacing to the generic cabling;
- suppliers of cabling components and installers of cabling with relevant requirements.
- a number of wireless applications have been analysed to determine the requirements specified herein.

Propagation of microwave energy indoors is complex and the operating range of communications devices will depend on carrier frequency, transmit power, building geometry and materials. Consult with the application standard and with equipment manuals for guidance on factors that should be taken into account during design of the wireless grid and prior to deployment of wireless access points.

1 Scope

The cabling specified in this Technical Report is considered to be in addition to and not in place of the infrastructure specified in ISO/IEC 11801. This Technical Report specifies a customer premises cabling system infrastructure for an array of coverage areas that form a wireless network grid within a building. It is applicable to all of the balanced and optical fibre cabling classes specified by ISO/IEC 11801.

This Technical Report specifies design and configuration of an ISO/IEC 11801 compliant horizontal cabling subsystem. Requirements and guidelines are provided with respect to:

a) Minimum configuration, structure and topology;
b) performance requirements for permanent links and channels;
c) coverage and location of telecommunications outlets;
d) interfaces to wireless access points;
e) power delivery over balanced cabling.

While placement and security of wireless access points are outside of scope of this Technical Report, placement of TOs is specified to enable flexible deployment of wireless services.

Safety (electrical, fire, etc.) and electromagnetic compatibility (EMC) requirements are outside the scope of this Technical Report.

2 Normative References

The following standards contain provisions that, through references in this text, constitute part of ISO/IEC TR XXXXX. At the time of publication, the editions indicated were valid. All standards are subject to revision. Parties to agreements based on this part of ISO/IEC TR XXXXX are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International standards.

ISO/IEC 11801 Ed.2:2002	*Information Technology – Generic cabling for customer premises*
ISO/IEC 14763-1	*Information Technology – Implementation and operation of customer premises cabling – Part 1: Administration*

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this Technical Report, the following definitions apply.

3.1.1
application
a system, with its associated transmission method, that is supported by cabling

3.1.2
balanced cable
a cable consisting of one or more metallic symmetrical cable elements (twisted pairs or quads)

3.1.3
cable element
the smallest construction unit (for example balanced pair, balanced quad, coaxial pair or single optical fibre) in a cable; a cable element may have a screen

3.1.4
cable unit
a single assembly of one or more cable elements of the same type or category; the cable unit may have a screen

3.1.5
cabling
a system of telecommunications cables, cords, and connecting hardware that can support the inter-connection of information technology equipment

3.1.6
channel
the end-to-end transmission path connecting any two pieces of application-specific equipment

NOTE A transmission path may use one or more pairs, may share a pair with another path, e.g. power feeding and information may run over the same pair.

3.1.7
connection
mated device or combination of devices including terminations connecting two cables or cable elements

3.1.8
consolidation point (CP)
a connection point in the horizontal cabling subsystem between a floor distributor and a telecommunications outlet

3.1.9
coverage area
the area served by terminal equipment connected to a telecommunications outlet

3.1.10
coverage area cord
a cord connecting the telecommunications outlet to terminal equipment that serves a coverage area (e.g., wireless access point)

3.1.11
CP link
the part of the permanent link between the floor distributor and the consolidation point, including the connecting hardware at each end

3.1.12
cross-connect
a technique enabling the termination of cable elements and the interconnection of these elements, primarily by means of patch cords or jumpers; incoming and outgoing cables are terminated at fixed points; they are interconnected with the help of a third cable, a patch cord or a jumper cable

3.1.13
floor distributor (FD)
the distributor used to connect between the horizontal cable and other cabling subsystems or equipment. (See telecommunications room)

3.1.14
grid
the arrangement of multiple contiguous coverage areas

3.1.15
information and communications technologies (ICT)
a group of applications using information and communications (telecommunications) technologies

3.1.16
interconnect
a technique enabling equipment cords (or cabling subsystems) to be terminated and connected to the cabling subsystems without using a patch cord or jumper; incoming or outgoing cables are terminated at a fixed point

3.1.17
link
the transmission path between two cabling system interfaces

3.1.18
multi-user telecommunications outlet assembly (MUTO)
a grouping in one location of several telecommunications outlets

3.1.19
optical fibre cable (or optical cable)
a cable comprising one or more optical fibre cable elements

3.1.20
pathway
a facility for the accommodation of cable

3.1.21
permanent link
the transmission path between two mated interfaces of generic cabling, excluding equipment cords, work area cords and cross-connections, but including the connecting hardware at each end

3.1.22
remote power feeding
the supply of power different from mains power to application-specific equipment via balanced cabling

3.1.23
space
area or volume defined by markings or fittings intended for the containment of connecting hardware

3.1.24
telecommunications room
enclosed space for housing telecommunications equipment, cable terminations, interconnect and cross-connect

3.1.25
terminal equipment
equipment that provides access to an application / service at a telecommunications outlet

3.1.26
transmission equipment
active equipment used to distribute applications from distributors to other distributors and to a telecommunications outlet (TO)

3.1.27
wireless access point
terminal equipment that provides service to wireless adapters and other wireless end point devices

3.2 Abbreviations

CC	Cross-Connect
CP	Consolidation Point
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EQP	Transmission Equipment
ffs	for further study
FD	Floor Distributor
ICT	Information and Communications Technology
IEV	International Electrotechnical Vocabulary
IT	Information Technology
MUTO	Multi-user telecommunications outlet
N/A	Not Applicable
PELV	Protective Extra Low Voltage
PP	Patch Panel
PS	Power Source
SELV	Safety Extra Low Voltage
TE	Terminal Equipment
TO	Telecommunications Outlet

4 Conformance

For a cabling installation intended for use with wireless applications to conform to this Technical Report the following shall apply.

a) The configuration, structure and topology of cabling shall conform to clause 5.

b) The entire system shall be composed of channels and links that meet the necessary level of performance specified in clause 6.

c) The coverage and location of the telecommunications outlet shall conform to clause 7.

d) The cabling interfaces to the wireless access points shall conform to clause 8.

e) When used, power delivery over balanced cabling shall conform to clause 9.

f) System administration shall meet the requirements of ISO/IEC 14763-1.

g) System pathways and spaces shall meet the requirements of ISO/IEC 18010

h) Regulations concerning safety and EMC shall be met as applicable to the location of the installation.

In all other respects, the cabling infrastructure shall be in full compliance with ISO/IEC 11801. No portion of this Technical Report shall be used to negate or replace the minimum requirements of ISO/IEC 11801.

5 Configuration, structure and topology

5.1 General

This clause identifies the functional elements, configuration and topology of a horizontal system to support wireless access points.

5.2 Functional elements

The functional elements of the horizontal cabling system are as follows:

- floor distributor (FD);
- horizontal cable;
- consolidation point (CP) - optional;
- telecommunications outlet (TO);

The type and number of functional elements used depends upon the type of premises and the application group(s) served. It is possible for the functions of multiple elements to be combined into a single element. Although equipment and coverage area cords are used to connect the transmission equipment to the cabling subsystem, they are not considered part of the cabling subsystem.

Equipment is connected at the telecommunications outlets and the distributors. During planning, consideration of a logical boundary between coverage areas served from different floor distributors should be considered. For example, such a boundary may be at a fixed structural boundary within the building or at areas that do not require coverage.

5.3 Cabling subsystems

A horizontal subsystem shall be used to connect wireless coverage areas to equipment at a distributor. The horizontal cabling subsystem ends at the telecommunications outlet. Coverage areas should connect to equipment at distributors on the same floor. Active equipment shall not be connected between the floor distributor and the telecommunications outlet.

Functional elements and requirements for campus backbone subsystems, building backbone subsystems and connections between subsystems shall comply with ISO/IEC 11801.

5.4 Topology

The horizontal cabling used to serve wireless coverage areas shall be configured in a star topology.

Passive connections between the horizontal cabling subsystem and other subsystems shall be achieved using cross-connections.

6 Media selection and performance

The horizontal cabling should provide an interface to the wireless coverage area to a 4 pair balanced cabling link. In addition to information transfer, balanced cabling may be used to concurrently deliver low voltage power to wireless access points from the telecommunications room. If optical fibre cabling is used, separate power access shall be provided to serve its associated wireless access point. The coverage area cabling for links and channels extending shall be:

- at least 4 balanced pairs capable of meeting class D, E or F channel requirements in accordance with ISO/IEC 11801;

or

- at least two optical fibres within at least one cable, and capable of meeting class OF-300, 500 or 2000 in accordance with ISO/IEC 11801.

Compliance to the applicable performance classes shall be achieved as specified in ISO/IEC 11801, clause 4.

7 Telecommunications outlet coverage and location

7.1 General

The design of generic cabling shall provide for telecommunications outlets to be installed throughout the wireless grid. All connections from a wireless access point to the horizontal cabling infrastructure shall be made at a telecommunications outlet that conforms to ISO/IEC 11801, clause 10. A sufficient density of telecommunications outlets will enhance the ability of the cabling to accommodate a wide range of wireless applications and appropriate coverage within the premises. Telecommunications outlets may be presented individually or in groups. Each wireless coverage area shall be served by a minimum of one telecommunications outlet.

NOTE Wireless access points are sometimes positioned to provide coverage areas that serve the same building space (e.g., to provide additional bandwidth). It is necessary to provide multiple horizontal cabling channels to locations where co-located coverage areas are planned.

7.2 Provisioning

Each telecommunications outlet shall be mounted in fixed locations and shall have a permanent means of identification that is visible when coverage area cords are connected to it. Because accessibility and flexure of coverage area cords is typically limited to installation, rather than use, they may be made using solid or stranded cables.

If used, application specific devices such as baluns, adapters, and power delivery apparatus shall be external to the telecommunications outlet.

7.3 Single user TO assembly

The implementation topology shall be selected from the options provided in ISO/IEC 11801 clause 7 for balanced cabling and in ISO/IEC 11801 clause 8 for optical fibre cabling.

In addition, where the single user TO assembly is used:

a) a single user TO assembly should be located in installer-accessible locations.

b) the performance contribution of coverage area cords, patch cords and equipment cords shall be taken into account to ensure that the channel requirements of clause 6 are met.

7.4 Multi-user TO assembly (MUTO)

In an open office environment, a single assembly of TOs may be used to serve more than one coverage area in a wireless grid. The implementation topology shall be selected from the options provided in ISO/IEC 11801 clause 7 for balanced cabling and in ISO/IEC 11801 clause 8 for optical fibre cabling. Such an assembly of TOs shall be known as a multi-user TO assembly or MUTO.

In addition, where the multi-user TO assembly is used:

a) a multi-user TO assembly shall be placed in a centralised location in the wireless grid so that contiguous groups of coverage areas are served by at least one multi-user TO assembly.

b) a multi-user TO assembly should be limited to serving only the number of coverage areas within a proximity determined by the total length of the equipment cable, the horizontal cable between the FD and MUTO, and the length of the coverage area cable needed to connect to the furthest wireless access point to be connected.

c) a multi-user TO assembly should be located in installer-accessible, permanent locations. If concealed, a visible identifier in the occupied space should identify its location.

d) a multi-user TO assembly shall not be installed in areas that are obstructed by fixed building structures or furnishings.

e) the performance contribution of coverage area cords, patch cords and equipment cords shall be taken into account to ensure that the channel requirements of clause 6 are met.

f) the length and routing of the coverage area cord should enable organised cable management that enables tracing and minimizes opportunities for incidental damage.

7.5 Consolidation point

The installation of a consolidation point in the horizontal cabling between the floor distributor and the telecommunications outlet may be useful in an environment where the flexibility of relocating TOs in coverage areas is required. One consolidation point is permitted between a FD and any TO. The consolidation point shall only contain passive connecting hardware and shall not be used for cross-connections. A single consolidation point may be used to serve horizontal cabling links that extend to both work areas and coverage areas.

In addition, where a consolidation point is used:

a) the consolidation point should be limited to serving the number of coverage areas, work areas or both, as determined by the maximum channel length.

b) a consolidation point should be located in accessible locations.

c) for balanced cabling, the consolidation point shall be located so that there is at least 15 m from it to the floor distributor.

d) a consolidation point shall be part of the administration system.

7.6 Dimensioning and configuring

Operating range performance prediction provides valuable input for determination of telecommunications outlet locations and should be performed and taken into account in the design of the horizontal subsystem. Likewise, a site survey should be performed prior to location selection and installation of wireless access points.

The design and positioning of the floor distributor and telecommunications outlets should ensure that the lengths of patch cords/jumpers and equipment cords are minimised and administration should ensure that the design lengths are maintained during operation.

TOs that serve coverage areas in a uniform open space should be located to support a “honeycomb” or hexagonal wireless grid geometry as shown in Figure 1.

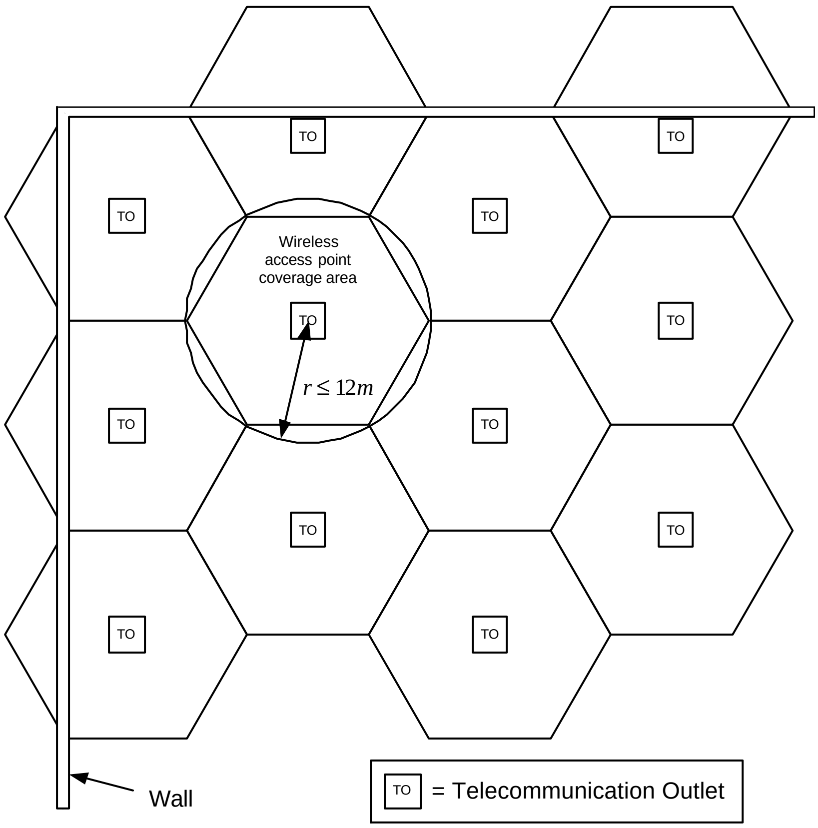


Figure 1 – Grid of telecommunications outlets for wireless coverage areas

Cabling that serves the wireless grid should be located in or on the ceilings directly above the floor space it serves. The number and placement of telecommunications outlets should enable connections to a coverage area grid based on a maximum coverage area radius of 12 m. In general TOs should be centrally located in their associated coverage areas and MUTOs should be centrally located in their associated coverage area grids.

In certain cases, wireless terminal equipment may be located in areas that are not readily accessible building occupants.

NOTE 1 Ceiling height should be considered when designing the coverage area grid to be served by the horizontal cabling. For example, placement of wireless access points on ceilings that exceed a 3m height may result in a lower coverage area radius at floor height.

NOTE 2 See Annex A for wireless networking applications supported by this Technical Report and their associated indoor typical indoor range.

8 Interfaces

8.1 General

The channel is the transmission path between equipment such as a LAN switch/hub and the wireless access point. A typical channel would consist of the horizontal subsystem together with coverage area and equipment cords. For longer reach services, the channel would be formed by the connection of two or more subsystems (including coverage area and equipment cords). The performance of the channel excludes the connections at the application-specific equipment.

The permanent link is the transmission path of an installed cabling subsystem including the connecting hardware at the ends of the installed cable. In the horizontal cabling subsystem, the permanent link consists of the telecommunications outlet, the horizontal cable, an optional CP and the termination of the horizontal cable at the floor distributor. The permanent link includes the connections at the ends of the installed cabling.

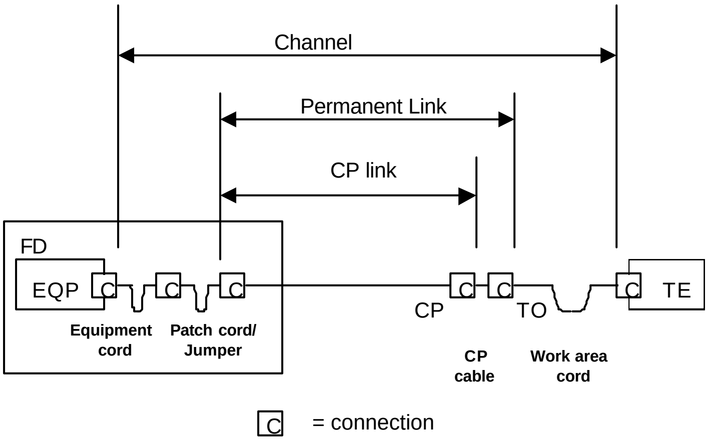
Equipment interfaces to generic cabling are located at the ends of each subsystem. Any distributor may have an equipment interface to an external service at any port, and may use either interconnects or cross-connects. Refer to ISO/IEC 11801 clause 7 for balanced cabling and in ISO/IEC 11801 clause 8 for optical fibre cabling. The consolidation point does not provide an equipment interface to the generic cabling system.

9 Power delivery over balanced cabling

Power may be provided to wireless access points and other types of DTEs by way of the balanced cabling interfaces. In this case, power may be introduced to the balanced cabling channel at the FD.

When mid-span power insertion equipment replaces a generic cabling component or components, it shall meet the performance requirements of the component or components it replaces (e.g., patch cord, patch panel or combination thereof), regardless of the interfaces used for input and output connections.

Placement of mid-span power insertion equipment shall be external to the permanent link. See Figure 2.

458 

459 **Figure 2 – Channel and Permanent link**

Annex A
(Informative)

Supported Applications

A.1 General

Wireless access points that are connected to cabled networks provide an interface to two distinct networking applications. One that is associated with the cabled equipment, and one that is associated with the wireless equipment.

A.2 Cabling applications

Applications that are supported by the balanced and optical fiber cabling specified in this Technical Report are identical to those specified in Annex F of ISO/IEC 11801. Other applications may also be supported.

A.3 Wireless applications

Cabling specified in this Technical Report is intended to support the deployment of wireless applications listed in Table A.1. Other applications may also be supported.

Table A.1 – Supported wireless applications

Application Standard	Title	Typical indoor range (radius)
IEEE 802.11	Wireless Local Area Networks (2 Mbit/s @ 2.4 GHz or infrared)	30 m
IEEE 802.11a	Wireless Local Area Networks (=54 Mbit/s @ 5 GHz)	12 m
IEEE 802.11b	Wireless Local Area Networks (11 Mbit/s @ 2.4 GHz)	30 m
DECT	Digital European Cordless Telephony (1 Mbit/s @ 1.8 GHz)	30 m (ffs)
Bluetooth II	ISM Band 1 Mbit/s @ 2.4 GHz	12 m (ffs)

478 # Bibliography

IEC 60364-4-41	*Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*
IEC 60364-5-52	*Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 52: Wiring systems*
IEC 61024 series	*Protection of structures against lightning*
IEC 61935-1	*Generic cabling systems - Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801 - Part 1: Installed cabling*
IEC 61935-2	*Generic cabling systems – Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801 – Part 2: Patch cords and work area cords*
ISO/IEC 11801	*Information Technology – Generic cabling for customer premises*
ISO/IEC 18010	*Information Technology – Pathways and spaces for customer premises cabling*
ISO/IEC 14763-2	*Information Technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*
ISO/IEC 14763-3	*Information Technology – Implementation and operation of customer premises cabling – Part 3: Testing of optical fibre cabling*
ITU-T K.31	*Bonding configurations and earthing of telecommunication installations inside a subscriber's building*

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ISO/IEC JTC 1/SC 25/WG 3 N 657

Date: 2003-02-19

Replaces ISO/IEC JTC 1/SC 25/WG 3 N n/a

ISO/IEC JTC 1/SC 25/WG 3
Customer Premises Cabling
Secretariat: Germany (DIN)

DOC TYPE:	**Liaison Report**
TITLE:	**Liaison report to IEEE 802.3, IEEE 802.11 and IEEE 802.15 on Cabling Guidelines for Remotely Powered Devices, WPANs and WLAN Access Points**
SOURCE:	**WG 3** (Wellington 72)
PROJECT:	**25.03.08: Generic cabling for customer premises**
STATUS:	**This liaison report was approved by WG 3 at its meeting in Wellington, New Zealand, 2003-02-10/14.**
ACTION ID:	**FYI**
DUE DATE:	**2003-09-15/18**
REQUESTED: ACTION	**This liaison report is sent to IEEE 802.3, IEEE 802.11 and IEEE 802.15 with the kind request for input to the work described below.** **The next meeting of ISO/IEC JTC 1/SC 25/WG 3 is planned in Switzerland 2003-09-15/18.** **Copy of this report is sent to ITU and JTC 1/SC 6 with the same request, as these standardisation bodies may also develop applications that have appropriate requirements.**
MEDIUM:	**Open**
No of Pages:	**2 (including cover)**

DISTRIBUTION:

Members of JTC 1/SC 25/WG 3, see N 658
JTC 1 Secretariat, Mrs Rajchel
JTC 1/SC 6 Secret. Ms. J. Lee
JTC 1/SC 25 Chairman, Dr. Zeidler
JTC 1/SC 25/WG 1 Chair/Sec, Wacks/Schoechle
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CENELEC TC 215 CPC Mr Gilmore
IEEE 802.3, Mr Grow
IEEE 802.15, Mr Heile
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JTC 1/SC 6/WG 6 Secretary, Mr van den Beld
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IEEE 802.11, Mr Kerry,
ETSI Mr Ochel, Mrs Laverack

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c/o Siemens AG, CT SR IC, Gotthelfstraße 24, D- 81677 München, Germany
Tel.: +49/89/923 967 57,
EM1: Walter.Pattay@Siemens.com EM2: Walter@Pattay.com

Ftp address SC 25: "ftp.iec.ch", login: "sc25mem", password: see SC 25 N 791
Home page SC 25: "http:/www.iec.ch/sc25"

Liaison report to IEEE 802.3, IEEE 802.11 and IEEE 802.15 on Cabling Guidelines for Remotely Powered Devices, WPANs and WLAN Access Points

Date: **2003-February-14**

To: **IEEE 802.3, IEEE 802.11 and IEEE 802.15**
Bob Grow, Chair IEEE 802.3 (bob.grow@intel.com)
Stuart Kerry, Chair IEEE 802.11 (stuart.kerry@philips.com)
Bob Heile, Chair IEEE 802.15 (bheile@ieee.org)

From: **ISO/IEC JTC 1/SC 25/WG 3**

Subject: **Cabling Guidelines for Remotely Powered Devices, WPANs and WLAN Access Points**

We would like to express our appreciation to IEEE 802.3af for their valuable guidance on cabling for remotely-powered devices, which was reviewed at our meeting in Wellington, New Zealand 10-14 February 2003. We also thank IEEE 802.11 for their letter dated 2003-02-13 [(WG 3(Wellington/IEEE)50]. Based on this input and our desire to address the pressing need for guidelines relating to cabling connections to wireless equipment, ISO/IEC JTC 1/SC 25/WG 3 has decided to undertake this work in two phases. The first phase to develop content that is applicable to wireless access points, and associated remote powering. The second phase to cover other applications that may require remote power, including those named in your letter dated 2002-Nov-14.

We specifically would like to direct the attentions of IEEE 802.3af and request their input on the portion of this draft on power delivery over balanced cabling (8.2). Likewise, we direct the attention of IEEE 802.11 and IEEE 802.15 to content related to coverage area radius and geometry (7.6.1), as well as the supported applications listed in Annex A.

We plan to issue cabling guidelines in the form of a Technical Report and attach an initial draft (ISO/IEC JTC 1/SC 25 N 835) for your consideration. We look forward to receiving your comments before our next meeting in Switzerland, 15-18 September 2003.

Respectfully submitted

ISO/IEC JTC 1/SC 25/WG 3

Attachment: ISO/IEC JTC 1/SC 25 N 835: PDTR ISO/IEC XXXXX: Information technology - Customer premises cabling for wireless access points

DTE Power via MDI

802.3af Task Force
Opening Plenary Meeting Report
March 10, 2003
DFW Airport, TX

Steve Carlson, TF Chair
scarlson@esta.org

M arch Plenary Meeting

- D4.0 Sponsor Ballot
  - Ballot opened 20 November 2002
  - Ballot closed 1 January 2003
  - 80 members in the Sponsor Ballot group
  - 77% return rate – 75% required
  - 92% approval rate – 75% required

March Plenary Meeting

- Interim meeting in Vancouver, BC
  - January 6 - 10, 2003
  - Comment resolution
    - Editorial 123
    - Technical 89
    - Technical Required 56
    - Many duplicates

March Plenary Meeting

- Interim Meeting in Milpitas, CA
  - Meeting space supplied by Cisco Systems
  - Finished comment resolution to D4.0
  - Created D4.1
  - 1st Recirculation Ballot – 20 day
    - Opened 10 February 2003
    - Closed 2 March 2003
    - 77% return rate, 94% approval
    - 98 comments (31 E, 40 T, 26 TR)
    - Many duplicates, 6 out-of-scope

Plans for the Week

The DTE Power via MDI TF will meet on Tuesday and Wednesday from 8:30AM to 5:30PM, and Thursday 8:30AM to noon in “Galaxy”.

Goals for the week:

- Comment Resolution
  - Comment resolution to D4.1
  - Sign-off on remaining TR’s from D4.0
  - Charter Editor to create and review D4.2
  - Prepare to start 2nd Recirculation Ballot

Plans for the Week

Future Meetings
Possible April Interim – IOL, Durham, NH
April 7 - 9, 2003

July Plenary – Hyatt Regency, San Francisco, CA
July 20 - 24, 2003

http://grouper.ieee.org/groups/802/meeting/future.pdf

In the News

Article on 802.3af in March 2003

IEEE Spectrum

(Web Edition)

http://www.spectrum.ieee.org/WEBONLY/resource/mar03/won802.html

In the News

Power over Ethernet (PoE) Interoperability Group Test Period

University of New Hampshire InterOperability Laboratory Durham, NH USA April 7 - April 11, 2003

In the News

The Gibson "Magic"
Ethernet/802.3af Powered electric guitar

In the News

The
Ethernet/802.3af Powered soap dispenser

Task Force Info

The DTE Power via MDI Task Force maintains up-to-date information at:

http://www.ieee802.org/3/af/index.html

All archive information from earlier meetings are available. Information on subscribing to the e-mail reflector, proper usage thereof, and presentation guidelines are here. Drafts may be found in the private area.

login: 802.3af   password: *******

IEEE 802.3ah
Ethernet in the First Mile
Task Force

Report to 802.3
Agenda and General Information

Hyatt DFW

10-March-2003

Agenda

- Reflector and WWW site
- Report from Vancouver interim meeting
- Objectives for this meeting
- IEEE standards process
  - New timeline
  - Reviewing draft D1.3
- Liaison letter(s)
- Split into tracks
  - P2MP
  - Cu
  - P2P
  - OAM
- Motion madness
- Future meetings

802.3ah Officers (New)

- Howard Frazier, 802.3ah Chair, *millardo@dominetsystems.com*
- Hugh Barrass, 802.3ah Vice Chair, *hbarrass@cisco.com*
- Wael Diab, 802.3ah Editor in Chief, *wdiab@cisco.com*
- Scott Simon, Recording Secretary, *ssimon@cisco.com*
- Behrooz Rezvani, Executive Secretary, *behrooz@ikanos.com*
- Gerry Pesavento, P2MP Chair, *gerry.pesavento@teknovus.com*
- Vipul Bhatt, Optics Chair, *vipul_bhatt@ieee.org*
- Matt Squire, OAM Chair, *mattsquire@acm.org*
- Barry O'Mahony, Copper Chair, *barry.omahony@intel.com*
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- Thomas Murphy, Optics Editor, *thomas.murphy@infineon.com*
- Kevin Daines, OAM Editor, *kevin.daines@worldwidepackets.com*
- Michael Beck, Copper Editor, *michael.beck@alcatel.be*

Affirmed by IEEE 802.3ah 6-January-2003

Reflector and web

- To subscribe to our reflector(s), send email to:

  majordomo@ieee.org

  and include one or more of the following
  in the ***body of the message:***

  subscribe stds-802-3-efm <*your email address*>
  subscribe stds-802-3-efm-copper <your email address>
  subscribe stds-802-3-efm-p2mp <your email address>
  subscribe stds-802-3-efm-p2p <your email address>
  subscribe stds-802-3-efm-oam <your email address>

- Our email reflector policy is described at:

  http://www.ieee802.org/3/efm/reflector.html

Reflector and web

- Our web site is located at:

  http://www.ieee802.org/3/efm

- Our private web site is located at:

  http://www.ieee802.org/3/efm/private

  username: 802.3ah
  password:*******

This is where we keep draft documents, and where a set of ITU-T recommendations and drafts is stored

Do NOT distribute this URL, username and password

Do NOT copy or distribute the documents on this site

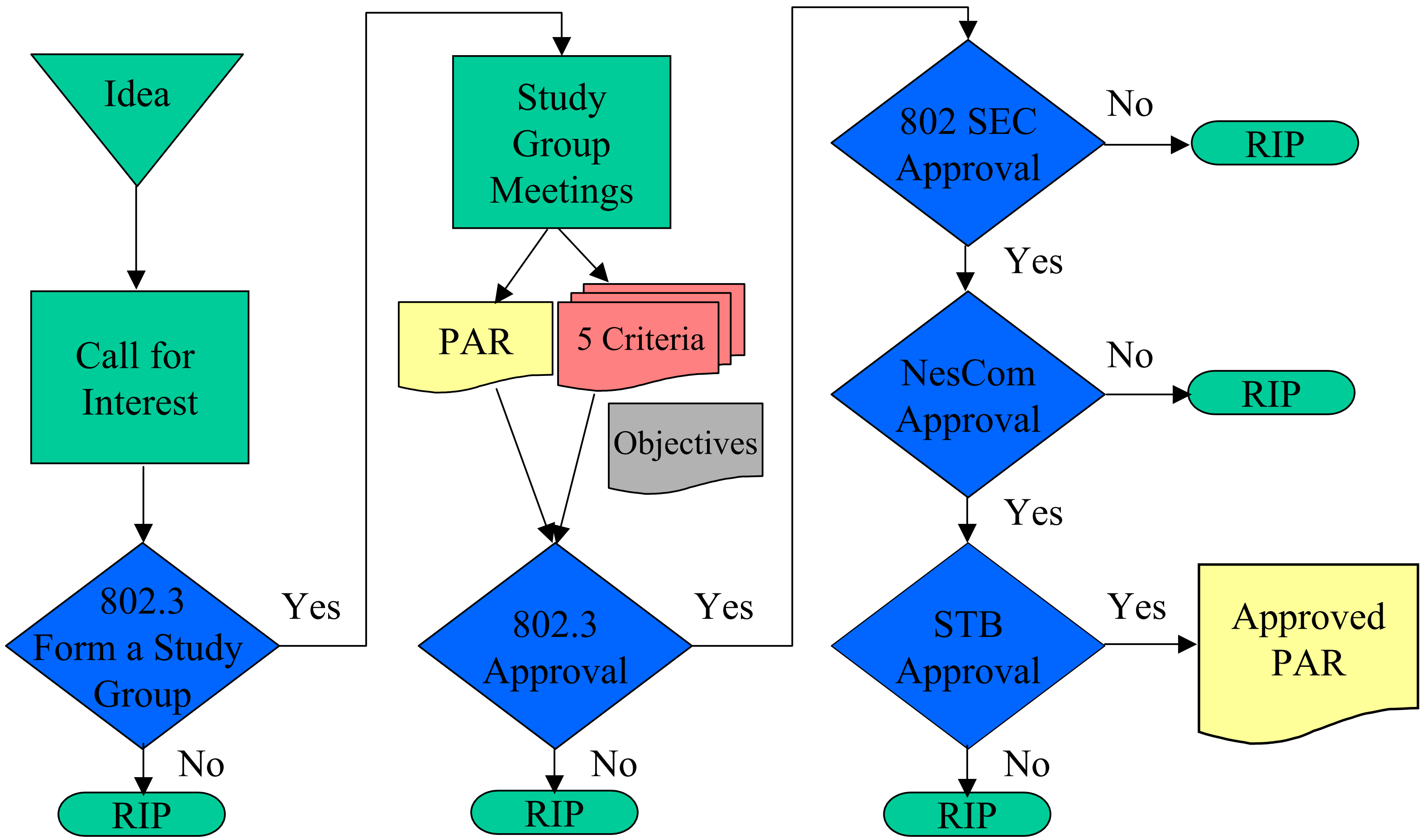
Report from Vancouver

- 4 day meeting - January 6-9 - hosted by IEEE 802 LMSC
- ~140 attendees in 802.3ah, ~250 overall
- Reviewed P802.3ah/D1.2
- Responded to 713 comments
- Big ticket items resolved!
  - Rejected EPON FEC bursting
  - Adopted EPON optical timing parameters
  - Adopted a copper PHY encapsulation method
  - Adopted a long reach copper PHY baseline proposal
- Sent letter to T1E1

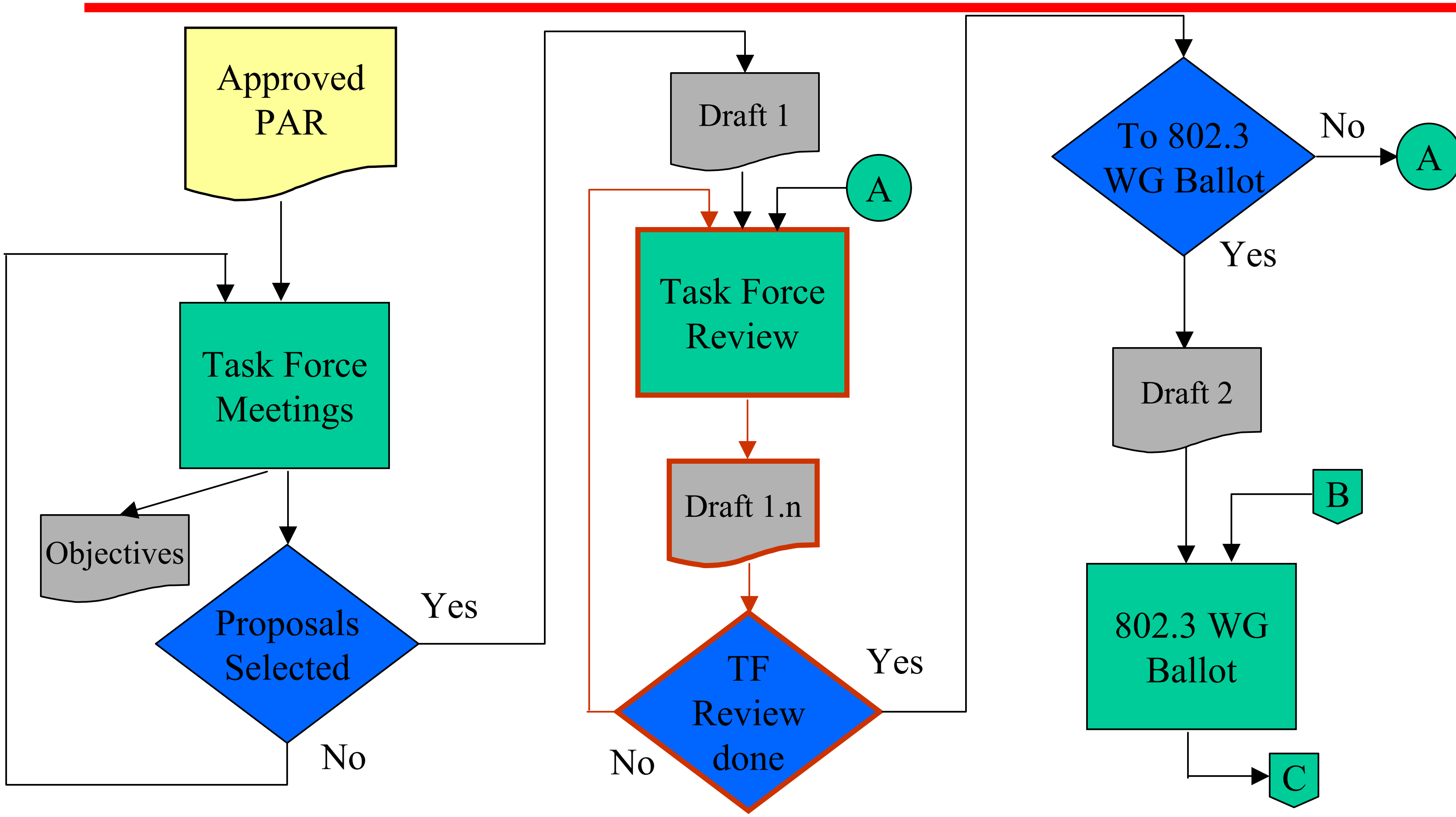
Objectives for this meeting

- Respond to comments on P802.3ah^{TM}/D1.3
- Big Ticket Items:
  - Extended temperature optics
  - Copper PHY management
  - 10Gig or not 10Gig?

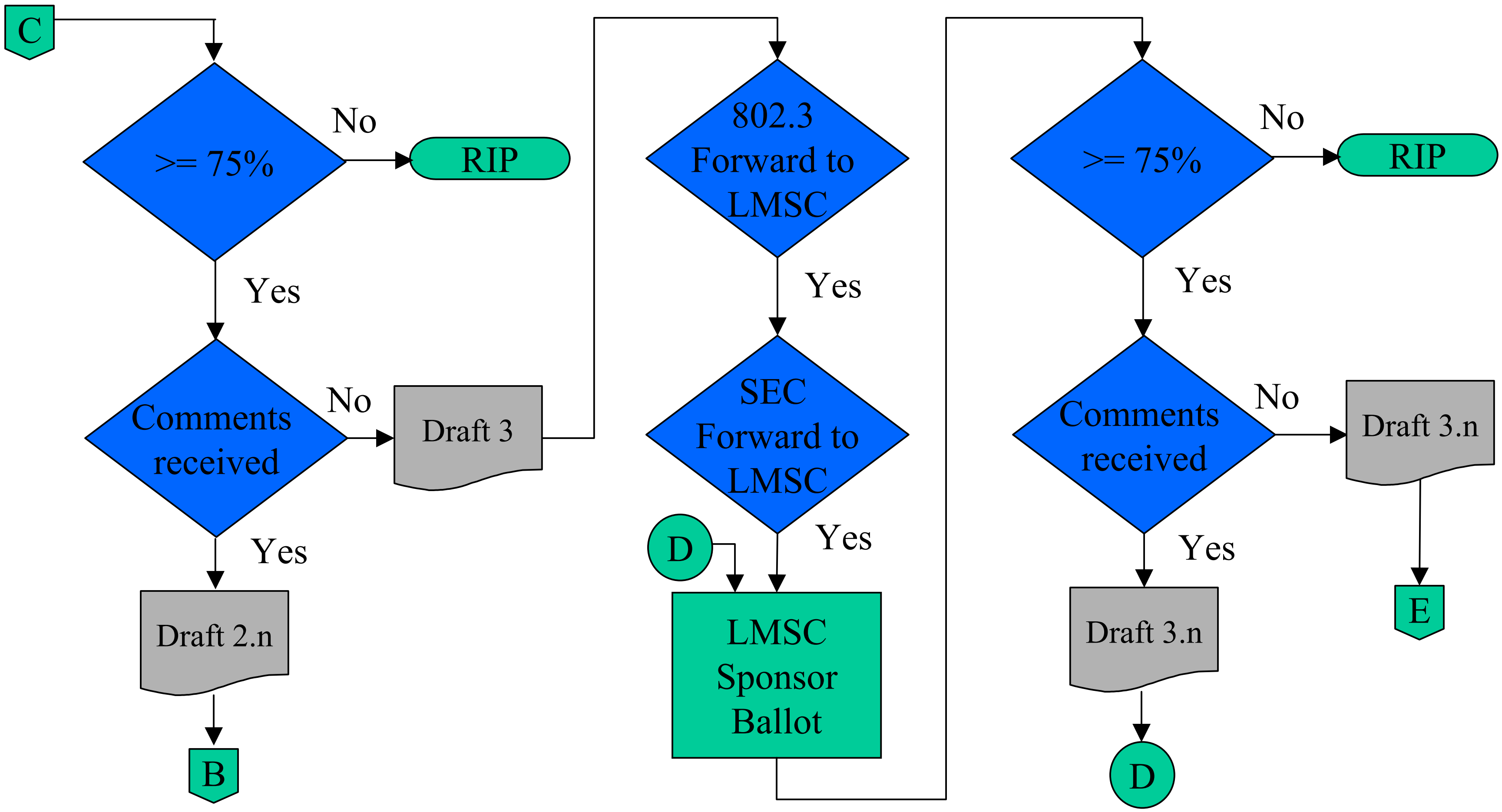
IEEE standards process



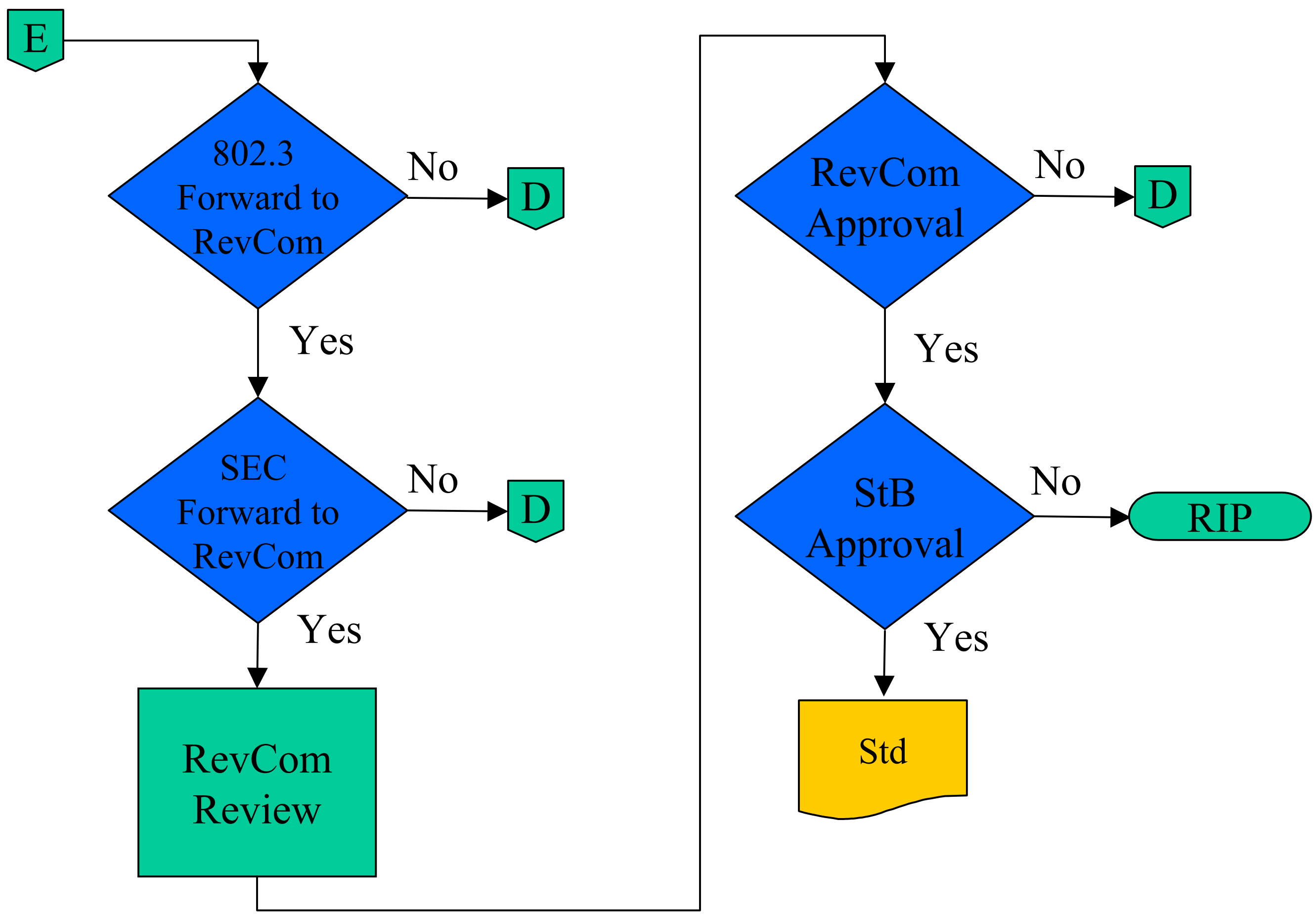
IEEE standards process



IEEE standards process



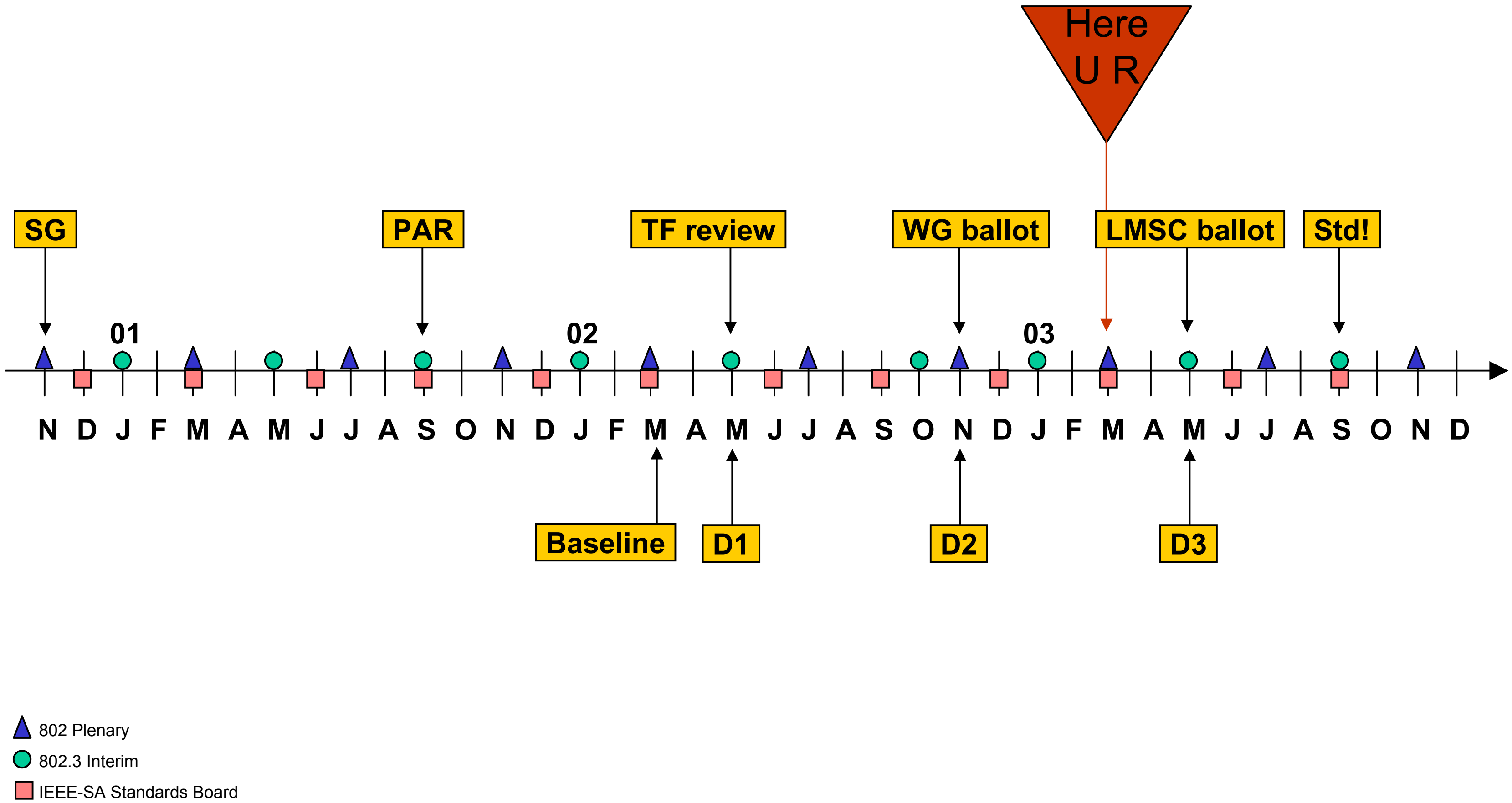
IEEE standards process



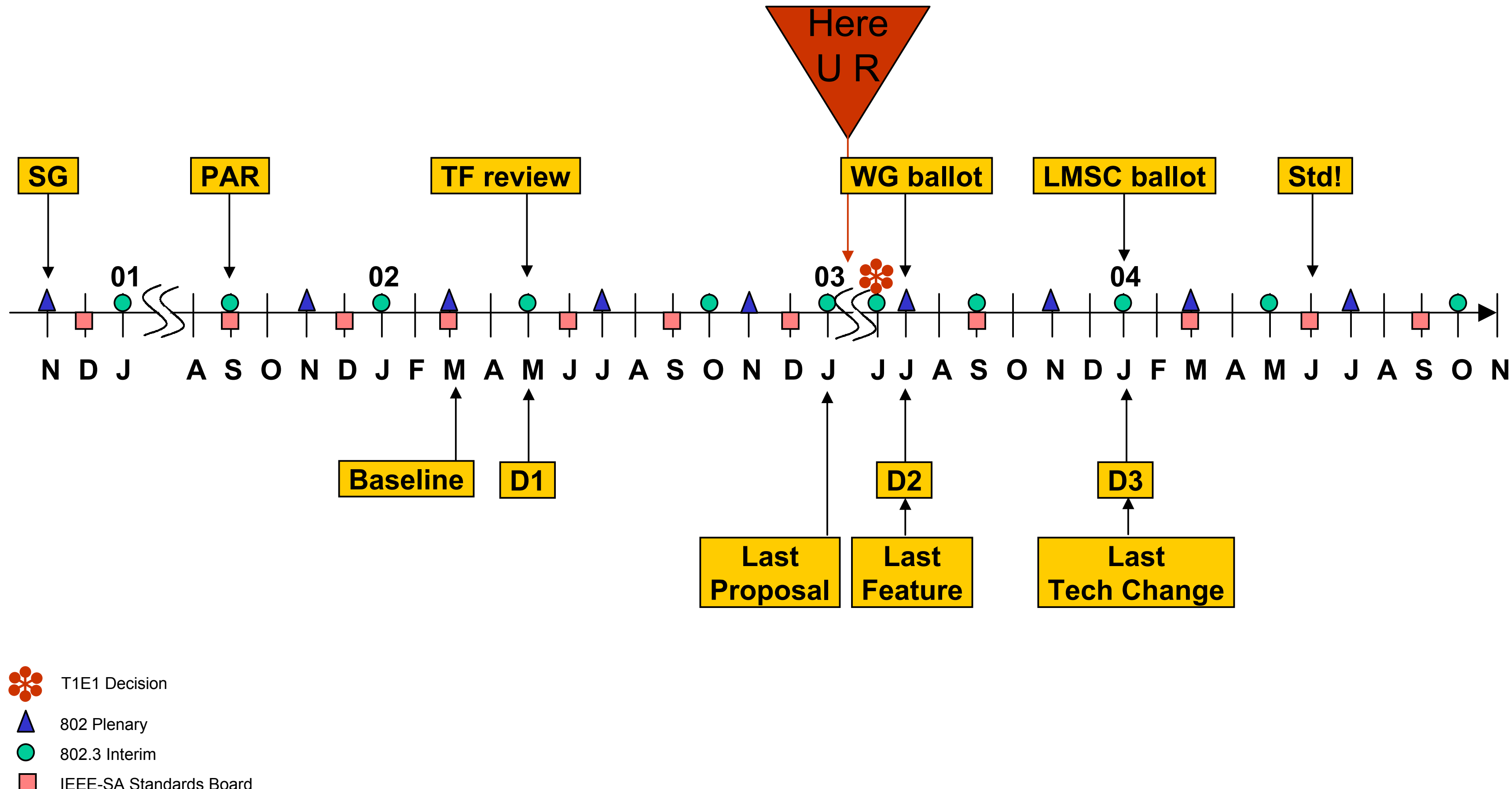
Schedule risk

- Our schedule has suffered a substantial slip
- The causes for the slip include:
  - ✓ Delay in adopting FEC baseline
  - ✓ Delay in adopting EPON optical timing parameters
  - ✓ Delay in adopting a copper PHY encapsulation baseline
  - ✓ Delay in adopting a long reach copper PHY baseline
  - **Time frame for decision on 10PASS-T line code**

Previously adopted timeline



Newly adopted timeline



Adopted by IEEE 802.3ah 9-January-2003

Reviewing draft D1.3

- Our editors have produced P802.3ah/D1.3, using D1.2 plus the comments that we resolved in Vancouver
- We have received ~1053 comments on D1.3 (Thank you!)
- We must craft and adopt a response to each comment
- Our editors will produce P802.3ah/D$\sqrt{2}$ after this meeting, based on the comment responses
- We will continue the Task Force review process

Liaison letters!

1. Letter received from T1E1 (Copper)
2. Letter received from ITU-T Q2/15 (Optics)
3. Another letter received from ITU-T Q2/15 (Optics)
4. Letter received from ITU-T Q4/15 (Copper)
5. Letter received from ITU-T Q12/15 (OAM)
6. Another letter received from ITU-T Q12/15 (OAM)
7. Letter received from ITU-T Q13/4 (OAM)
8. Letter received from ITU-T Q14/4 (EPON)
9. Letter received from ITU-T QALL/15 (Optics)
10. Letter received from TR42 (Optics)

Plan for the week

Time	MON	TUE				WED				THU
8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30		P2MP (EPON) Cons 11	Optics Cons 12	OAM Cons 10	Copper Cons 13	P2MP (EPON) Cons 11	Optics Cons 12	OAM Cons 10	Copper Cons 13	**802.3ah EFM Task Force Closing Session**
12:00 12:30	Lunch break	Lunch break				Lunch break				Lunch break
1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30	**802.3 CSMA/CD Opening Plenary**	P2MP (EPON) Cons 11	Optics Cons 12	OAM Cons 10	Copper Cons 13	P2MP (EPON) Cons 11	Optics Cons 12	OAM Cons 10	Copper Cons 13	**802.3 CSMA/CD Closing Plenary**
6:00	Dinner break	Dinner break				Dinner break				Dinner break
6:30 7:00 7:30	**Tutorial**	**Tutorial**				**Social**				
8:00 8:30 9:00	**Tutorial**	**Tutorial**								
9:30										

Future meetings

- **12-15 May 2003, Seoul, South Korea - J.W. Marriot**
  hosted by Infineon & Samsung
- **23-24 June 2003, Ottawa,**
  hosted by Nortel Networks
- **20-25 July 2003, San Francisco,**
  IEEE 802 Plenary
- **15-18 September 2003, Ancona Italy,**
  hosted by Aethra

INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

STUDY PERIOD 2001-2004

COM 15 – LS 25 – E

English only

Original: English

Question(s):	12/15	20-31 January 2003

LIAISON STATEMENT

Source:	ITU-T SG 15, Q.12/15	
Title:	Code point for OAM Frames	
To:	**802.3ah, Q.3/13**	
Approval:	Agreed to at SG 15 meeting, Geneva, 20 –31 January 2003	
For:	**Action 802.3ah, Information Q.3/13**	
Deadline:	**31 March 2003**	
Contact:	Malcolm Betts Nortel Networks Canada	Tel: +1 613 763 7860 Fax: +1 613 763 6608 Email: betts01@nortelnetworks.com
Contact:		Tel: Fax: Email:

Please don't change the structure of this table, just insert the necessary information.

Q.3/13 have requested the assignment of a code point for OAM frames that they will define later. We understand that you are considering assigning a vendor specific code. This causes us some concern since the intent of Q.3/13 is that these OAM frames will be utilized by any vendor that provides Ethernet equipment for deployment in the Telecommunications network. We urge you to consider these concerns when reaching a decision on the code point assignment.

____

INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

STUDY PERIOD 2001-2004

COM 15 – LS 4 – E

English only

Original: English

Question(s):	2/15	20-31 January 2003

LIAISON STATEMENT

Source:	ITU-T SG 15
Title:	Information on "point-to-point Ethernet based optical access system"
To:	IEEE P802 (Paul Nikolich; IEEE 802 chair;mailto:j.carlo@ieee.org p.nikolich@ieee.org)
Approval:	Agreed to at SG 15 meeting, Geneva, 20 –31 January 2003
For:	Information
Deadline:	N/A

Contact:	Tatsuya Egashira NEC Japan	Tel:+81-44-435-5649 Fax:+81-44-435-5683 Email:t-egashira@cj.jp.nec.com
Contact:		Tel: Fax: Email:

Please don't change the structure of this table, just insert the necessary information.

At their 20 – 31 January 2003 meeting, SG 15 gave consent to Recommendation G.985 "100 Mbit/s point-to-point Ethernet based optical access system".

To improve understanding, we would like to clarify the difference of specification between ITU-T Recommendation G.985 and IEEE 802.3 as follows:

Recommendation G.985 specifies the layer-1 devices whose main functionality is the conversion between an electrical signal and an optical signal.

Such devices do not have a MAC address and some higher layer functions, and they behave like a repeater, therefore the OAM layer is positioned in the middle of the MII.

The unique point of Recommendation G.985 is that it defines a single fibre solution.

In the future, Q.2/15 will consider the other point-to-point Ethernet access specification that complies with draft IEEE 802.3 OAM format where available.

We do not consider that these specifications interfere with each other.

G.985 is attached in other Lisison sent same date

____

	INTERNATIONAL TELECOMMUNICATION UNION **TELECOMMUNICATION STANDARDIZATION SECTOR** STUDY PERIOD 2001-2004	**COM 15 – LS 23 – E** **English only** **Original: English**

Question(s):	12/15	20-31 January 2003

LIAISON STATEMENT

Source:	ITU-T SG 15, Q.12/15
Title:	SG 15 Ethernet Activities
To:	**MEF** (Mr. Nan Chen, President MEF) (nan_chen@atrica.com) **IEEE 802.1** (Mr. Tony Jeffree, Chair - tony@jeffree.co.uk) **IEEE 802.3** (Mr. Bob Grow, Chair – bob.grow@intel.com) **OIF** (Mr. Joe Berthold, President – berthold@ciena.com) Copy to: **Mr. Paul Bottorff, MEF** - pbottorf@nortelnetworks.com **Mr.Bob Klessig, MEF** - bklessig@cisco.com **Mr. David Law, IEEE 802.3** - David_Law@3mail.3Com.com **Mr. Howard Frazier, IEEE 802.3ah** – howard@dominet.com **Mr. John McDonough, OIF** – jmcdonou@cisco.com
Approval:	Agreed to at SG 15 meeting, Geneva, 20 –31 January 2003
For:	**Information**
Deadline:	

Contact:	Malcolm Betts Nortel Networks Canada	Tel: +1 613 763 7860 Fax: +1 613 763 6608 Email: betts01@nortelnetworks.com
Contact:		Tel: Fax: Email:

Please don't change the structure of this table, just insert the necessary information.

This is to advise you that at its January 2003 meeting, ITU-T SG 15 had the following Recommendations identified on Ethernet related activities. We have provided a website for you to access our drafts of the following documents.

Working Party 1 – Question 2
Network Access *(Ethernet Access)*

G.p2p	100 Mb point-to-point Ethernet Access – Requirements & Architecture
G.ces	Circuit Emulation Services over Ethernet

Working Party 3

OTN Structure (*Ethernet over Transport*)

G.ethna	Ethernet Layer Network Architecture	Q12
G.eota	Ethernet over Transport Architecture	Q12
G.esm	Ethernet over Transport – Ethernet Service Multiplexing	Q12
G.ethsrv	Ethernet over Transport – Ethernet Service Characteristics	Q12
G.smc	Service Management Channel – private line	Q12
G.etnni	Ethernet over Transport Network Node Interface	Q11
G.euni	Ethernet User to Network Interface	Q11
G.eeq	Ethernet over transport Equipment Functional Blocks	Q9
G.eemf	Ethernet Equipment Management Function	Q9
G.efrw	Ethernet Framework	Q9
G.cesa	Circuit Emulation Services over Ethernet - Architecture	Q12

SG 15 - Working Party 4 – Question 16
OTN Technology *(Ethernet over Fibre)*

G.capp	CWDM Applications (including Ethernet)

SG 15 - Working Party 5
Projects and Promotion *(Coordination)*

OTNT SWP	Optical Transport Networks and Technologies – Standardization Work Plan
ANT SWP	Access Network Transport – Standardization Work Plan

SG 13 – Question 3

Ethernet OAM

For completeness, we are aware of the following SG13 activity on OAM. However, please communicate with SG13 directly for access to drafts of these documents.

Y.17ethreq	Ethernet layer Requirements
Y.17ethoam	Ethernet OAM functionality
Y.17ethps	Ethernet protection switching
Y.ethperf	Ethernet error performance

Proposal

SG15 will make available copies of the SG15 documents that have draft text agreed at this meeting to the MEF at the URL noted below.

Any comments on these drafts would be appreciated.

References

ITU-T SG15 homepage: http://www.itu.int/ITU-T/studygroups/com15/index.asp

ITU-T TIES access: http://ties.itu.int/u/tsg15/sg15/

IETF, IEEE, MEF access:
ftp://sg15opticalt:otxchange@ftp.itu.int/tsg15opticaltransport/COMMUNICATIONS/index.html

INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

STUDY PERIOD 2001-2004

COM 15 – LS 49 – E

English only

Original: English

Question(s):	All/15	20-31 January 2003

LIAISON STATEMENT

Source:	ITU-T Study Group 15
Title:	Optical Transport Networks & Technologies Standardization Work Plan, Issue 3

To:	ITU-T SG4, SG9, SG11, SG13, SG17, Committee T1 (T1X1), IEC (TC86), IETF (Sub-IP and Transport Areas), IEEE (802), ATM Forum, OIF, MEF, TIA (FO-4.1, FO-4.5)	
Approval:	Agreed to at SG 15 meeting, Geneva, 20 –31 January 2003	
For:	**Information and Action**	
Deadline:	**August 2003**	
Contact:	Mark L. Jones, Q.19/15 Rapporteur Sprint U.S.A.	Tel: +1 913 794 2139 Fax: +1 913 794 0415 Email: mark.jones@mail.sprint.com
Contact:		Tel: Fax: Email:

Please don't change the structure of this table, just insert the necessary information.

During the Study Group 15 meeting held 20-31 January 2003, a new issue of the Optical Transport Networks & Technologies Standardization Work Plan (OTNT SWP) (Issue 3) has been created as part of the lead study group responsibilities on Optical Technology. Study Group 15 entrusts WP 5/15, Question 19/15, with the task of carrying out the Lead Study Group responsibilities on Optical Technologies.

The OTNT SWP contains a list of standardization bodies and contacts relevant to optical standardization, a list of known holes/overlaps/conflicts in current work, lists of Standards and Recommendations from ITU and other organizations and a list of documents being actively worked.

The document is reproduced in the attached Report COM 15-R 40 and will soon be available at http://www.itu.int/ITU-T/studygroups/com15/otn/index.html

The document in the web will be available for quick reference as web pages by section, or for free download as a complete document.

Q19/15 kindly requests your cooperation in developing and maintaining this document as a useful tool for coordinating the standardization of optical transport networks & technologies. Periodically, Q19 will draw your attention to the new document issue and would appreciate any suggestion or comment.

Attachment: COM 15-R 40

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10GBASE-CX4 Study Group Report

Dan Dove

hp ProCurve Networks Business

Chair, 10GBASE-CX4 Study Group

Meetings;

- **CFI in November**
    - Presented 57 slides covering technical work, preliminary PAR and Five Criteria.
    - Specified intent to make aggressive schedule to meet market demand for wiring closet and data center applications.
    - Howard Baumer volunteered to edit a working paper prior to Sacramento Interim.
- Three meetings held since the CFI in November **(PAR, 5 Criteria, Objectives addressed at each meeting)**
- **Sacramento (Dec 2002)**
    - 14 Presentations on pre-emphasis, equalization, channel characteristics, etc.
    - Developed broad consensus on objectives and approach to CX4 partitioning.
    - Reviewed version 1.0 of working paper and provided recommendations for specification approach.
    - Assigned people to review 802.3 clauses for requisite changes
- **Vancouver (Jan 2003)**
    - 13 Presentations addressing technical aspects of working paper.
    - Extensive Review of version 2.0 of working paper.
    - Developed “Loss Budget Team” and “Channel Model Team” to focus work effort for Raleigh interim meeting.

Meetings;

- **Raleigh/Durham (Feb 2003)**
  - 5 Presentations from teams and individuals
  - Reviewed PAR and objectives for pre-submittal to 802.3
  - Reviewed version 3.0 of working paper and directed editor to prepare version 3.1 for pre-submittal to 802.3
- **Dallas (now)**
  - Take presentations to finalize numbers in working paper.
  - Review PAR, Objectives, 5-Criteria one more time
  - Present to 802.3 any changes that might have occurred to any documents on Thursday

If you have comments from reviewing version 3.0, please come by and bring them to the study group this week.

10GBASE-CX4
5 Criteria

Interim Meeting
Roseville, California
December 16-17, 2002

Broad Market Potential

Broad set(s) of applications
Multiple vendors, multiple users
Balanced cost, LAN Vs. attached stations

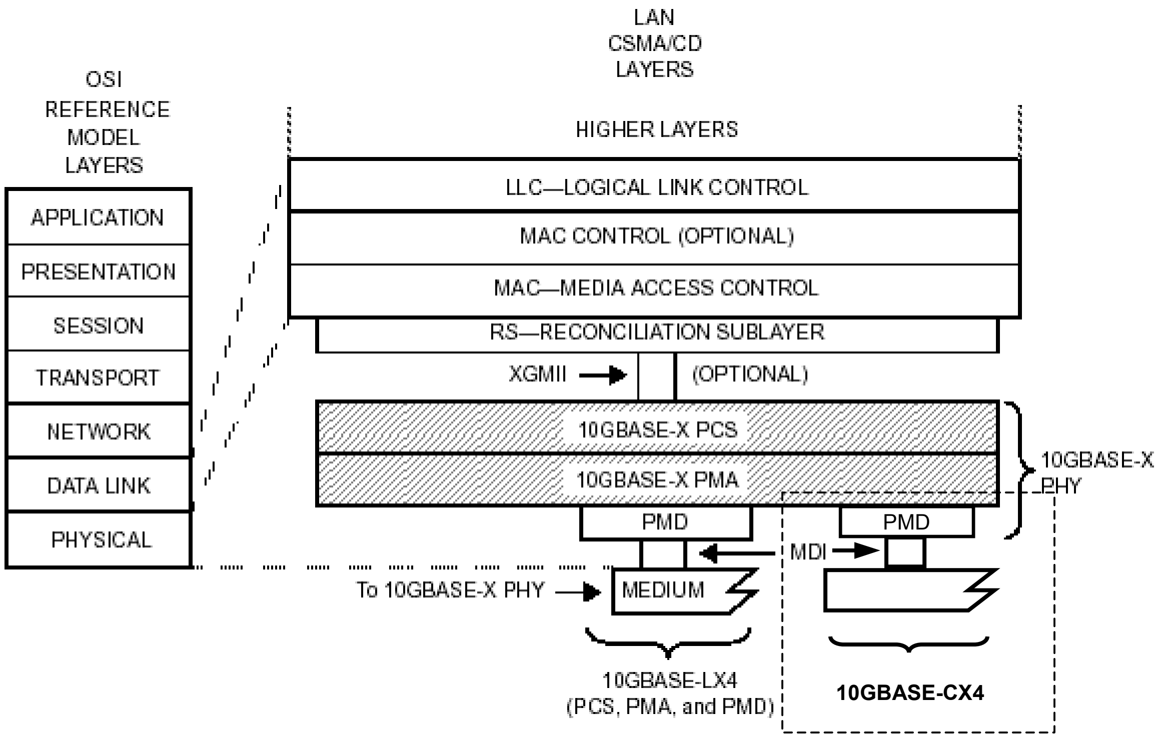
- **As customers move to 1000BASE-T attached desktops, the demand for a very low-cost 10Gbps link to interconnect switches gains demand. 10GBASE-CX4 meets that demand.**
- **A 10 Gb/s 802.3 copper PMD solution extends Ethernet capabilities providing higher bandwidth for multimedia, distributed processing, imaging, medical, CAD/CAM, and pre-press applications by lowering the cost of high performance 10Gbps network links for:**
  - **LAN Backbone, server and gateways in Data Centers**
  - **Switch aggregation**
  - **Storage Area Network (SAN)**
- **average of 35 participants from 39 companies have attended 3 10-Gigabit Copper study group meetings and indicate that they plan to participate in the standardization of 10GBASE-CX4**
- **This level of commitment indicates that a standard will be supported by a large group of vendors. This in turn will ensure that there will be a wide variety of equipment supporting a multitude of applications.**
- **10GBASE-CX4 helps bring a cost sensitive solution to this performance space.**

Compatibility with IEEE Std 802.3

Conformance with CSMA/ CD MAC, PLS
Conformance with 802.2
Conformance with 802

- The proposed standard will conform to the full-duplex operating mode of the 802.3 MAC, appropriately adapted for 10 Gb/ s operation.
- As was the case in previous 802.3 standards, a new physical layer will be defined for 10 Gb/s operation.
- The proposed standard will conform to the 802.3 MAC Client Interface, which supports 802.2 LLC.
- The proposed standard will conform to the 802.1 Architecture, Management and Interworking.
- The proposed standard will define a set of systems management objects which are compatible with OSI and SNMP system management standards.

Compatibility with IEEE Std 802.3



MDI=MEDIUM DEPENDENT INTERFACE
PCS=PHYSICAL CODING SUBLAYER
PHY=PHYSICAL LAYER DEVICE

PMA=PHYSICAL MEDIUM ATTACHMENT
PMD=PHYSICAL MEDIUM DEPENDENT
XGMII=10GIGABIT MEDIA INDEPENDENT INTERFACE

Distinct Identity

Substantially different from other 802.3 specs/ solutions
Unique solution for problem (not two alternatives/ problem)
Easy for document reader to select relevant spec

- **The current 802.3 10Gb/s specification includes only fiber-optic media types for interconnection of devices. There are no copper media types .**
- **The specification will be done in a format consistent with the IEEE document requirements thus making it easy for implementers to understand and design to.**
- **The proposed specification will use copper media similar to other high speed networking technologies (FibreChannel, IB4X) but does so with the IEEE 802.3 MAC as the over-riding layer which will result in higher compatibility and lower cost for Ethernet systems.**

Technical Feasibility

Demonstrated feasibility; simulations, reports - - working models
Proven technology, reasonable testing
Confidence in reliability

- Technical presentations, given to 802.3, have demonstrated the feasibility of using the copper media in useful network topologies at a rate of 10 Gb/s.
  Other technologies like IB4X and 10GFC are deployed with similar media and baud rates.
- The principle of extending higher speeds to copper media has been well established by previous work within 802.3. The 10 Gb/s work will build on this experience.
- Vendors of XAUI components and systems are building reliable products which operate at 10 Gb/s on copper media, and meet worldwide regulatory and operational requirements.
- Component vendors have presented research on the feasibility of physical layer signaling at a rate of 10 Gb/s on copper media using a wide variety of innovative low cost technologies.

Economic Feasibility

Cost factors known, reliable data
Reasonable cost for performance expected
Total Installation costs considered

- **Cost factors are extrapolated from the XAUI component supplier base and technology curves.**
- **Cost for a copper 10GBASE-CX4 implementation is expected to be 1/20 to 1/10 that of 10GBASE-optical solutions.**
- **Costs for assemblies based on established standards (IB4X,10GFC) are well known and reasonable.**
- **Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.**

Motion:Amend 5 criteria document as stated and forward to 802.3 as supporting documentation for our PAR

M: Peter B
S: Jeff C

Y: 16 N: 0 A: 1

PAR FORM

PAR Status: Amendment of Standard (Unapproved PAR)
PAR Approval Date: 0000-00-00
PAR Signature Page on File: Yes
Review of Standards Development Process: No

1. Assigned Project Number: 802.3ak

2. Sponsor Date of Request: 2003-02-03

3. Type of Document: Standard for

4. Title of Document:
Draft: Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Physical Layer and Management Parameters for 10 Gb/s Operation, Type 10GBASE-CX4

5. Life Cycle: Full Use

6. Type of Project:
6a. Is this an update to an existing PAR? No

6b. The Project is a: Amendment to Std 802.3-2002 and 802.3ae-2002

7. Contact Information of Working Group:
Name of Working Group: 802.3
Name of Working Group Chair: Robert M Grow
Telephone: 858-391-4622 **FAX:** 858-391-4659
Email: bob.grow@ieee.org

8. Contact Information of Official Reporter (If different than Working Group Chair)
Name of Official Reporter: (if different than WG contact)
Telephone: **FAX:**
Email:

9. Contact Information of Sponsoring Society or Standards Coordinating Committee:
Name of Sponsoring Society and Committee: Computer Society Local and Metropolitan Area Networks
Name of Sponsoring Committee Chair: Paul Nikolich
Telephone: 857-205-0050 **FAX:** 781-334-2255
Email: p.nikolich@ieee.org
Name of Liaison Rep. (If different than Sponsor Chair):
Telephone: **FAX:**
Email:

10. The Type of ballot is: Individual Sponsor Ballot
Expected Date of Submission for Initial Sponsor Ballot: 2003-11-21

11. Fill in Projected Completion Date for Submittal to RevCom: 2004-03-24
Explanation for Revised PAR that Completion date is being extended past the original four-year life of the PAR:

12. Scope of Proposed Project:

The scope of this project is to specify additions to and appropriate modifications of IEEE Std 802.3 as amended by IEEE Std 802.3ae-2002 (and any other approved amendment or corrigendum) to add a copper Physical Medium Dependent (PMD) option for 10 Gb/s operation, building upon the existing 10GBASE-X Physical Coding Sublayer (PCS) and 10 Gigabit Attachment Unit Interface (XAUI) specifications.

13. Purpose of Proposed Project:

The purpose of this project is to provide a lower-cost option for interconnection of closely located equipment (within ~15m of cable), typically within a stack or between equipment racks within a room.

14. Intellectual Property:

Sponsor has reviewed the IEEE patent policy with the working group? Yes
Sponsor is aware of copyrights relevant to this project? No
Sponsor is aware of trademarks relevant to this project? No
Sponsor is aware of possible registration of objects or numbers due to this project? Yes

15. Are you aware of other standards or projects with a similar scope? No

Similar Scope Project Information:

16. Is there potential for this standard (in part or in whole) to be submitted to an international organization for review/adoption?: Yes

If yes, please answer the following questions:

Which International Organization/Committee? IEC TCJTC1 SC6 WG3

International Contact Information?	Robin Tasker CLRC +44-1925-603758 R.Tasker@dl.ac.uk

17. Will this project focus on Health, Safety or Environmental Issues? No

18. Additional Explanatory Notes: (Item Number and Explanation)

Proposal for an initial draft of a 10GBASE-CX4 PMD Version 3.2

by: Howard Baumer, Broadcom
David Law, 3Com
Naresh Raman, LSI Logic
Peter Bradshaw, BitBlitz
Schelto VanDoorn, Intel
Jeff Cain, Cisco

30.5.1.1.2 aMAUType

Change this subclause as follows:

ATTRIBUTE

APPROPRIATE SYNTAX:

A GET-SET ENUMERATION that meets the requirements of the description below:

global	undefined
other	See
unknown	Initializing, true state or type not yet known
AUI	no internal MAU, view from AUI
10BASE5	Thick coax MAU as specified in Clause 8
FOIRL	FOIRL MAU as specified in 9.9
10BASE2	Thin coax MAU as specified in Clause 10
10BROAD36	Broadband DTE MAU as specified in Clause 11
10BASE-T	UTP MAU as specified in Clause 14, duplex mode unknown
10BASE-THD	UTP MAU as specified in Clause 14, half duplex mode
10BASE-TFD	UTP MAU as specified in Clause 14, full duplex mode
10BASE-FP	Passive fiber MAU as specified in Clause 16
10BASE-FB	Synchronous fiber MAU as specified in Clause 17
10BASE-FL	Asynchronous fiber MAU as specified in Clause 18, duplex mode unknown
10BASE-FLHD	Asynchronous fiber MAU as specified in Clause 18, half duplex mode
10BASE-FLFD	Asynchronous fiber MAU as specified in Clause 18, full duplex mode
100BASE-T4	Four-pair Category 3 UTP as specified in Clause 23
100BASE-TX	Two-pair Category 5 UTP as specified in Clause 25, duplex mode unknown
100BASE-TXHD	Two-pair Category 5 UTP as specified in Clause 25, half duplex mode
100BASE-TXFD	Two-pair Category 5 UTP as specified in Clause 25, full duplex mode
100BASE-FX	X fiber over PMD as specified in Clause 26, duplex mode unknown
100BASE-FXHD	X fiber over PMD as specified in Clause 26, half duplex mode
100BASE-FXFD	X fiber over PMD as specified in Clause 26, full duplex mode
100BASE-T2	Two-pair Category 3 UTP as specified in Clause 32, duplex mode unknown
100BASE-T2HD	Two-pair Category 3 UTP as specified in Clause 32, half duplex mode
100BASE-T2FD	Two-pair Category 3 UTP as specified in Clause 32, full duplex mode
1000BASE-X	X PCS/PMA as specified in Clause 36 over undefined PMD, duplex mode unknown
1000BASE-XHD	X PCS/PMA as specified in Clause 36 over undefined PMD, half duplex mode
1000BASE-XFD	X PCS/PMA as specified in Clause 36 over undefined PMD, full duplex mode
1000BASE-LX	X fiber over long-wavelength laser PMD as specified in Clause 38, duplex mode unknown
1000BASE-LXHD	X fiber over long-wavelength laser PMD as specified in Clause 38, half duplex mode
1000BASE-LXFD	X fiber over long-wavelength laser PMD as specified in Clause 38, full duplex mode
1000BASE-SX	X fiber over short-wavelength laser PMD as specified in Clause 38, duplex mode unknown
1000BASE-SXHD	X fiber over short-wavelength laser PMD as specified in Clause 38, half duplex mode
1000BASE-SXFD	X fiber over short-wavelength laser PMD as specified in Clause 38, full duplex mode
1000BASE-CX	X copper over 150-Ohm balanced cable PMD as specified in Clause 39, duplex mode unknown
1000BASE-CXHD	X copper over 150-Ohm balanced cable PMD as specified in Clause 39, half duplex mode

1000BASE-CXFD	X copper over 150-Ohm balanced cable PMD as specified in Clause 39, full duplex mode
1000BASE-T	Four-pair Category 5 UTP PHY to be specified in Clause 40, duplex mode unknown
1000BASE-THD	Four-pair Category 5 UTP PHY to be specified in Clause 40, half duplex mode
1000BASE-TFD	Four-pair Category 5 UTP PHY to be specified in Clause 40, full duplex mode
10GBASE-X	X PCS/PMA as specified in Clause 48 over undefined PMD
10GBASE-LX4	X fibre over 4 lane 1310nm optics as specified in Clause 53
10GBASE-CX4	X copper over 8 pair 100-Ohm balanced cable as specified in Clause 54
10GBASE-R	R PCS/PMA as specified in Clause 49 over undefined PMD
10GBASE-ER	R fibre over 1550nm optics as specified in Clause 52
10GBASE-LR	R fibre over 1310nm optics as specified in Clause 52
10GBASE-SR	R fibre over 850nm optics as specified in Clause 52
10GBASE-W	W PCS/PMA as specified in Clauses 49 and 50 over undefined PMD
10GBASE-EW	W fibre over 1550nm optics as specified in Clause 52
10GBASE-LW	W fibre over 1310nm optics as specified in Clause 52
10GBASE-SW	W fibre over 850nm optics as specified in Clause 52
802.9a	Integrated services MAU as specified in IEEE Std 802.9 ISLAN-16T

30B.2 ASN.1 module for CSMA/CD managed objects

Change this subclause as follows:

```
TypeValue::= ENUMERATED {
        global              (0),      --undefined
        other               (1),      --undefined
        unknown             (2),      --initializing, true state not yet known
        AUI                 (7),      --no internal MAU, view from AUI
        10BASE5             (8),      --Thick coax MAU as specified in Clause 8
        FOIRL               (9),      --FOIRL MAU as specified in 9.9
        10BASE2             (10),     --Thin coax MAU as specified in Clause 10
        10BROAD36           (11),     --Broadband DTE MAU as specified in Clause 11
        10BASE-T            (14),     --UTP MAU as specified in Clause 14, duplex mode
                                        unknown
        10BASE-THD          (141),    --UTP MAU as specified in Clause 14, half duplex mode
        10BASE-TFD          (142),    --UTP MAU as specified in Clause 14, full duplex mode
        10BASE-FP           (16),     --Passive fiber MAU as specified in Clause 16
        10BASE-FB           (17),     --Synchronous fiber MAU as specified in Clause 17
        10BASE-FL           (18),     --Asynchronous fiber MAU as specified in Clause 18, duplex
                                        mode unknown
        10BASE-FLHD         (181),    --Asynchronous fiber MAU as specified in Clause 18, half
                                        duplex mode
        10BASE-FLFD         (182),    --Asynchronous fiber MAU as specified in Clause 18, full
                                        duplex mode
        100BASE-T4          (23),     --Four-pair Category 3 UTP as specified in Clause 23
        100BASE-TX          (25),     --Two-pair Category 5 UTP as specified in Clause 25, duplex
                                        mode unknown
        100BASE-TXHD        (251),    --Two-pair Category 5 UTP as specified in Clause 25, half
                                        duplex mode
        100BASE-TXFD        (252),    --Two-pair Category 5 UTP as specified in Clause 25, full
                                        duplex mode
        100BASE-FX          (26),     --X fiber over PMD as specified in Clause 26, duplex mode
                                        unknown
```

100BASE-FXHD	(261),	--X fiber over PMD as specified in Clause 26, half duplex mode
100BASE-FXFD	(262),	--X fiber over PMD as specified in Clause 26, full duplex mode
100BASE-T2	(32),	--Two-pair Category 3 UTP as specified in Clause 32, duplex mode unknown
100BASE-T2HD	(321),	--Two-pair Category 3 UTP as specified in Clause 32, half duplex mode
100BASE-T2FD	(322),	--Two-pair Category 3 UTP as specified in Clause 32, full duplex mode
1000BASE-X	(36),	--X PCS/PMA as specified in Clause 36 over unknown PMD, duplex mode unknown
1000BASE-XHD	(361),	--X PCS/PMA as specified in Clause 36 over unknown PMD, half duplex mode
1000BASE-XFD	(362),	--X PCS/PMA as specified in Clause 36 over unknown PMD, full duplex mode
1000BASE-LX	(381),	--X fiber over long-wavelength laser PMD as specified in Clause 38, duplex mode unknown
1000BASE-LXHD	(382),	--X fiber over long-wavelength laser PMD as specified in Clause 38, half duplex mode
1000BASE-LXFD	(383),	--X fiber over long-wavelength laser PMD as specified in Clause 38, full duplex mode
1000BASE-SX	(384),	--X fiber over short-wavelength laser PMD as specified in Clause 38, duplex mode unknown
1000BASE-SXHD	(385),	--X fiber over short-wavelength laser PMD as specified in Clause 38, half duplex mode
1000BASE-SXFD	(386),	--X fiber over short-wavelength laser PMD as specified in Clause 38, full duplex mode
1000BASE-CX	(39),	--X copper over 150-Ohm balanced cable PMD as specified in Clause 39, duplex mode unknown
1000BASE-CXHD	(391),	--X copper over 150-Ohm balanced cable PMD as specified in Clause 39, half duplex mode
1000BASE-CXFD	(392),	--X copper over 150-Ohm balanced cable PMD as specified in Clause 39, full duplex mode
1000BASE-T	(40),	--Four-pair Category 5 UTP PHY as specified in Clause 40, duplex mode unknown
1000BASE-THD	(401),	--Four-pair Category 5 UTP PHY as specified in Clause 40, half duplex mode
1000BASE-TFD	(402),	--Four-pair Category 5 UTP PHY as specified in Clause 40, full duplex mode
10GBASE-X	(48)	--X PCS/PMA as specified in Clause 48 over undefined PMD
10GBASE-LX4	(481)	--X fibre over WWDM optics as specified in Clause 53
10GBASE-CX4	(482)	--X copper over 8 pair 100-Ohm balanced cable as specified in Clause 54
10GBASE-R	(49)	--R PCS/PMA as specified in Clause 49 over undefined PMD
10GBASE-ER	(491)	--R fibre over 1550nm optics as specified in Clause 52
10GBASE-LR	(492)	--R fibre over 1310nm optics as specified in Clause 52
10GBASE-SR	(493)	--R fibre over 850nm optics as specified in Clause 52
10GBASE-W	(50)	--W PCS/PMA as specified in Clauses 49 and 50 over undefined PMD
10GBASE-EW	(501)	--W fibre over 1550nm optics as specified in Clause 52
10GBASE-LW	(502)	--W fibre over 1310nm optics as specified in Clause 52
10GBASE-SW	(503)	--W fibre over 850nm optics as specified in Clause 52
802.9a	(99)	--Integrated services MAU as specified in IEEE Std 802.9 ISLAN-16T

}

44. Introduction to 10 Gb/s baseband network

44.1.1 Scope

Change pharagraph 1 & 2 in 44.1.1 to read as follows:

10 Gigabit Ethernet uses the IEEE 802.3 MAC sublayer, connected through a 10 Gigabit Media Independent Interface (XGMII) to Physical Layer entities such as 10GBASE-SR, 10GBASE-LX4, 10GBASE-CX4, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, and 10GBASE-EW.

10 Gigabit Ethernet extends the IEEE 802.3 MAC beyond 1000 Mb/s to 10 Gb/s. The bit rate is faster and the bit times are shorter—both in proportion to the change in bandwidth. The minimum packet transmission time has been reduced by a factor of ten. A rate control mode (see ~~4.2.3.2.2~~4.2.3.2.2) is added to the MAC to adapt the average MAC data rate to the SONET/SDH data rate for WAN-compatible applications of this standard. Achievable topologies for 10 Gb/s operation are comparable to those found in 1000BASE-X full duplex mode and equivalent to those found in WAN applications.

44.1.2Objectives

Change 44.1.2 to read as follows:

The following are the objectives of 10 Gigabit Ethernet:

a) Support the full duplex Ethernet MAC.
b) Provide 10 Gb/s data rate at the XGMII.
c) Support LAN PMDs operating at 10 Gb/s, and WAN PMDs operating at SONET STS-192c/SDH VC-4-64c rate.
d) Support cable plants using optical fiber compliant with ISO/IEC 11801: 1995.
e) Allow for a nominal network extent of up to 40 km.
f) Support operation over 15m of copper cable as specified in section 54.8.
g) Meet or exceed FCC/CISPR Class A operation.
h) Support a BER objective of 10^{-12}.

44.1.3 Relationship of 10 Gigabit Ethernet to the ISO OSI reference model

Change item d in 44.1.3 to read as follows:

d) The MDI as specified in Clause 53 for 10GBASE-~~LX4~~ LX4, Clause 54 for 10GBASE-CX4 and in Clause 52 for other PMD types.

44.1.4.4 Physical Layer signaling systems

Change 2nd paragraph in 44.1.4.4 to read as follows:

The term 10GBASE-X, specified in ~~Clause 48~~ Clauses 48, 53 and ~~Clause 53~~54, refers to a specific family of physical layer implementations based upon 8B/10B data coding method. The 10GBASE-X family of physical layer implementations is composed of 10GBASE-~~LX4~~LX4 and 10GBASE-CX4.

Change Table 44-1 to read as follows:

Table 44–1—Nomenclature and clause correlation

Nomenclature	Clause								
	48	**49**	**50**	**51**	**52**			**53**	**54**
	8B/10B PCS & PMA	**64B/66B PCS**	**WIS**	**Serial PMA**	**850 nm Serial PMD**	**1310 nm Serial PMD**	**1550 nm Serial PMD**	**1310 nm WDM PMD**	**4-Lane Cu PMD**
10GBASE-SR		M[a]		M	M				
10GBASE-SW		M	M	M	M				
10GBASE-LX4	M							M	
10GBASE-CX4	M								M
10GBASE-LR		M		M		M			
10GBASE-LW		M	M	M		M			
10GBASE-ER		M		M			M		
10GBASE-EW		M	M	M			M		

[a]M = Mandatory

Change 4th paragraph in 44.1.4.4 to read as follows:

Specifications of each physical layer device are contained in Clause 52 and Clause ~~53~~53 and Clause 54.

44.3 Delay constraints

Change Table 44-2 to read as follows:

Table 44–2—Round-trip delay constraints (informative)

Sublayer	Maximum (bit time)	Maximum (pause_quanta)	Notes
MAC, RS and MAC Control	8192	16	See 46.1.4.
XGXS and XAUI	4096	8	Round-trip of 2 XGXS and trace for both directions. See 47.2.2.
10GBASE-X PCS and PMA	2048	4	See 48.5.
10GBASE-R PCS	3584	7	See 49.2.15.
WIS	14336	28	See 50.3.7.
CX4 PMD	512	1	Includes **1 meter** of 24AWG cable.
LX4 PMD	512	1	Includes 2 meters of fiber. See 53.2.
Serial PMA and PMD	512	1	Includes 2 meters of fiber. See 52.2.

44.4 Protocol Implementation Conformance Statement (PICS) proforma

Change 1st paragraph in 44.4 to read as follows:

The supplier of a protocol implementation that is claimed to conform to any part of IEEE 802.3, Clause 45 through Clause ~~53~~54, demonstrates compliance by completing a Protocol Implementation Conformance Statement (PICS) proforma.

45. Management Data Input/Output (MDIO) Interface

Change 45.2.1.6.1 to read as follows:

45.2.1.6.1 PMA/PMD type selection (1.7.~~2~~3:0)

Change 1st paragraph in 45.2.1.6.1 to read as follows:

The PMA/PMD type of the 10G PMA/PMD shall be selected using bits ~~2~~ 3 through 0. The PMA/PMD type abilities of the 10G PMA/PMD are advertised in bits 7 through 0 of the 10G PMA/PMD status 2 register. A 10G PMA/PMD shall ignore writes to the PMA/PMD type selection bits that select PMA/PMD types it has not advertised in the status register. It is the responsibility of the STA entity to ensure that mutually acceptable MMD types are applied consistently across all the MMDs on a particular PHY.

Change table 45-7 to read as follows:

Table 45–7—10G PMA/PMD control 2 register bit definitions

Bit(s)	Name	Description	R/W[a]
1.7.15:4~~3~~	Reserved	Value always 0, writes ignored	R/W
1.7.3:0	PMA/PMD type selection	3 2 1 0 1 1 1 x = Reserved 1 1 0 1 = Reserved 1 1 0 0 = 10GBASE-CX4 PMA/PMD type 1 0 x x = Reserved 0 1 1 1 = 10GBASE-SR PMA/PMD type 0 1 1 0 = 10GBASE-LR PMA/PMD type 0 1 0 1 = 10GBASE-ER PMA/PMD type 0 1 0 0 = 10GBASE-LX4 PMA/PMD type 0 0 1 1 = 10GBASE-SW PMA/PMD type 0 0 1 0 = 10GBASE-LW PMA/PMD type 0 0 0 1 = 10GBASE-EW PMA/PMD type 0 0 0 0 = Reserved	R/W

[a]R/W = Read/Write

45.2.1.7 10G PMA/PMD status 2 register (Register 1.8)

Change Table 45-8 to read as follows:

Table 45–8—10G PMA/PMD status 2 register bit definitions

Bit(s)	Name	Description	R/W[a]
1.8.15:14	Device present	15 14 1 0 = Device responding at this address 1 1 = No device responding at this address 0 1 = No device responding at this address 0 0 = No device responding at this address	RO
1.8.13	Transmit fault ability	1 = PMA/PMD has the ability to detect a fault condition on the transmit path 0 = PMA/PMD does not have the ability to detect a fault condition on the transmit path	RO
1.8.12	Receive fault ability	1 = PMA/PMD has the ability to detect a fault condition on the receive path 0 = PMA/PMD does not have the ability to detect a fault condition on the receive path	RO
1.8.11	Transmit fault	1 = Fault condition on transmit path 0 = No fault condition on transmit path	RO/LH
1.8.10	Receive fault	1 = Fault condition on receive path 0 = No fault condition on receive path	RO/LH
1.8.9	~~Reserved~~ 10GBASE-CX4 ability	~~Ignore on read~~ 1 = PMA/PMD is able to perform 10GBASE-CX4 0 = PMA/PMD is not able to perform 10GBASE-CX4	RO
1.8.8	PMD transmit disable ability	1 = PMD has the ability to disable the transmit path 0 = PMD does not have the ability to disable the transmit path	RO
1.8.7	10GBASE-SR ability	1 = PMA/PMD is able to perform 10GBASE-SR 0 = PMA/PMD is not able to perform 10GBASE-SR	RO
1.8.6	10GBASE-LR ability	1 = PMA/PMD is able to perform 10GBASE-LR 0 = PMA/PMD is not able to perform 10GBASE-LR	RO
1.8.5	10GBASE-ER ability	1 = PMA/PMD is able to perform 10GBASE-ER 0 = PMA/PMD is not able to perform 10GBASE-ER	RO
1.8.4	10GBASE-LX4 ability	1 = PMA/PMD is able to perform 10GBASE-LX4 0 = PMA/PMD is not able to perform 10GBASE-LX4	RO
1.8.3	10GBASE-SW ability	1 = PMA/PMD is able to perform 10GBASE-SW 0 = PMA/PMD is not able to perform 10GBASE-SW	RO
1.8.2	10GBASE-LW ability	1 = PMA/PMD is able to perform 10GBASE-LW 0 = PMA/PMD is not able to perform 10GBASE-LW	RO

Table 45–8—10G PMA/PMD status 2 register bit definitions *(continued)*

Bit(s)	Name	Description	R/W[a]
1.8.1	10GBASE-EW ability	1 = PMA/PMD is able to perform 10GBASE-EW 0 = PMA/PMD is not able to perform 10GBASE-EW	RO
1.8.0	PMA loopback ability	1 = PMA has the ability to perform a loopback function 0 = PMA does not have the ability to perform a loopback function	RO

[a]RO = Read Only, LH = Latching High

Renumber original sections 45.2.1.7.6 thru 45.2.1.7.15 as 45.2.1.7.7 thru 45.2.1.7.16 and add the following as section 45.2.1.7.6:

45.2.1.7.6 10GBASE-CX4 ability (1.8.9)

When read as a one, bit 1.8.4 indicates that the PMA/PMD is able to support a 10GBASE-CX4 PMA/PMD type. When read as a zero, bit 1.8.4 indicates that the PMA/PMD is not able to support a 10GBASE-CX4 PMA/PMD type.

45.2.1.9.5 Global PMD receive signal detect (1.10.0)

Change 3rd paragraph in 45.2.1.9.5 to read as follows:

Multiple wavelength or multiple lane PMD types indicate the global status of the lane-by-lane signal detect indications using this bit. This bit is read as a one when all the lane signal detect indications are one; otherwise, this bit is read as a zero.

45.5.5.3 PMA/PMD management functions

Item	Feature	Subclause	Value/Comment	Status	Support
MM1	Device responds to all register addresses for that device	45.2		PMA:M	Yes [ ] N/A [ ]
MM2	Writes to undefined and read-only registers have no effect	45.2		PMA:M	Yes [ ] N/A [ ]
MM3	Operation is not affected by writes to reserved and unsupported bits.	45.2		PMA:M	Yes [ ] N/A [ ]
MM4	Reserved and unsupported bits return a value of zero	45.2		PMA:M	Yes [ ] N/A [ ]
MM5	Latching low bits remain low until after they have been read via the management interface	45.2		PMA:M	Yes [ ] N/A [ ]
MM6	Latching low bits assume correct value once read via the management interface	45.2	Correct value is based upon current state	PMA:M	Yes [ ] N/A [ ]

Item	Feature	Subclause	Value/Comment	Status	Support
MM7	Latching high bits remain high until after they have been read via the management interface	45.2		PMA:M	Yes [ ] N/A [ ]
MM8	Latching high bits assume correct value once read via the management interface	45.2	Correct value is based upon current state	PMA:M	Yes [ ] N/A [ ]
MM9	Action on reset	45.2.1.1.1	Reset the registers of the entire device to default values and set bit 15 of the Control register to one	PMA:M	Yes [ ] N/A [ ]
MM10	Return 1 until reset completed	45.2.1.1.1		PMA:M	Yes [ ] N/A [ ]
MM11	Control and management interfaces are restored to operation within 0.5 s of reset	45.2.1.1.1		PMA:M	Yes [ ] N/A [ ]
MM12	Responds to reads of bit 15 during reset	45.2.1.1.1		PMA:M	Yes [ ] N/A [ ]
MM13	Device responds to transactions necessary to exit low-power mode while in low-power state	45.2.1.1.2		PMA:M	Yes [ ] N/A [ ]
MM14	Speed selection bits 13 and 6 are written as one	45.2.1.1.3		PMA:M	Yes [ ] N/A [ ]
MM15	Invalid writes to speed selection bits are ignored	45.2.1.1.3		PMA:M	Yes [ ] N/A [ ]
MM16	PMA is set into Loopback mode when bit 0 is set to a one	45.2.1.1.4		PMA*ALB:M	Yes [ ] N/A [ ]
MM17	PMA transmit data is returned on receive path when in loopback	45.2.1.1.4		PMA*ALB:M	Yes [ ] N/A [ ]
MM18	PMA ignores writes to this bit if it does not support loopback.	45.2.1.1.4		PMA*!ALB:M	Yes [ ] N/A [ ]
MM19	PMA returns a value of zero when read if it does not support loopback.	45.2.1.1.4		PMA*!ALB:M	Yes [ ] N/A [ ]
MM20	Writes to status 1 register have no effect	45.2.1.2		PMA:M	Yes [ ] N/A [ ]
MM21	Receive link status implemented with latching low behavior	45.2.1.2.2		PMA:M	Yes [ ] N/A [ ]
MM22	Unique identifier is composed of OUI, model number and revision	45.2.1.3		PMA:M	Yes [ ] N/A [ ]
MM23	10G PMA/PMD type is selected using bits ~~2~~3:0	45.2.1.6.1		PMA:M	Yes [ ] N/A [ ]

Item	Feature	Subclause	Value/Comment	Status	Support
MM24	10G PMA/PMD ignores writes to type selection bits that select types that it has not advertised	45.2.1.6.1		PMA:M	Yes [ ] N/A [ ]
MM25	Writes to the status 2 register have no effect	45.2.1.7		PMA:M	Yes [ ] N/A [ ]
MM26	PMA/PMD returns a value of zero for transmit fault if it is unable to detect a transmit fault	45.2.1.7.4		PMA:M	Yes [ ] N/A [ ]
MM27	Transmit fault is implemented using latching high behavior	45.2.1.7.4		PMA*PLF:M	Yes [ ] N/A [ ]
MM28	PMA/PMD returns a value of zero for receive fault if it is unable to detect a receive fault	45.2.1.7.5		PMA*!PLF:M	Yes [ ] N/A [ ]
MM29	Receive fault is implemented using latching high behavior	45.2.1.7.5		PMA*PLF:M	Yes [ ] N/A [ ]
MM30	Writes to register 9 are ignored by device that does not implement transmit disable	45.2.1.8		PMA*!PTD:M	Yes [ ] N/A [ ]
MM31	Single wavelength device uses lane zero for transmit disable	45.2.1.8		PMA*PTD:M	Yes [ ] N/A [ ]
MM32	Single wavelength device ignores writes to bits 1 – 4 and returns a value of zero for them	45.2.1.8		PMA*PTD:M	Yes [ ] N/A [ ]
MM33	Setting bit 4 to a one disables transmission on lane 3	45.2.1.8.1		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM34	Setting bit 4 to a zero enables transmission on lane 3	45.2.1.8.1		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM35	Setting bit 3 to a one disables transmission on lane 2	45.2.1.8.2		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM36	Setting bit 3 to a zero enables transmission on lane 2	45.2.1.8.2		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM37	Setting bit 2 to a one disables transmission on lane 1	45.2.1.8.3		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM38	Setting bit 2 to a zero enables transmission on lane 1	45.2.1.8.3		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM39	Setting bit 1 to a one disables transmission on lane 0	45.2.1.8.4		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM40	Setting bit 1 to a zero enables transmission on lane 0	45.2.1.8.4		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]

Item	Feature	Subclause	Value/Comment	Status	Support
MM41	Setting bit 0 to a one disables transmission	45.2.1.8.5		PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM42	Setting bit 0 to a zero enables transmission	45.2.1.8.5	Only is all lane transmit disables are zero	PMA*PTD:M	Yes [ ] No [ ] N/A [ ]
MM43	Unique identifier is composed of OUI, model number and revision	45.2.1.10		PMA:M	Yes [ ] N/A [ ]

48. Physical Coding Sublayer (PCS) and Physical Medium Attachment (PMA) sublayer, type 10GBASE-X

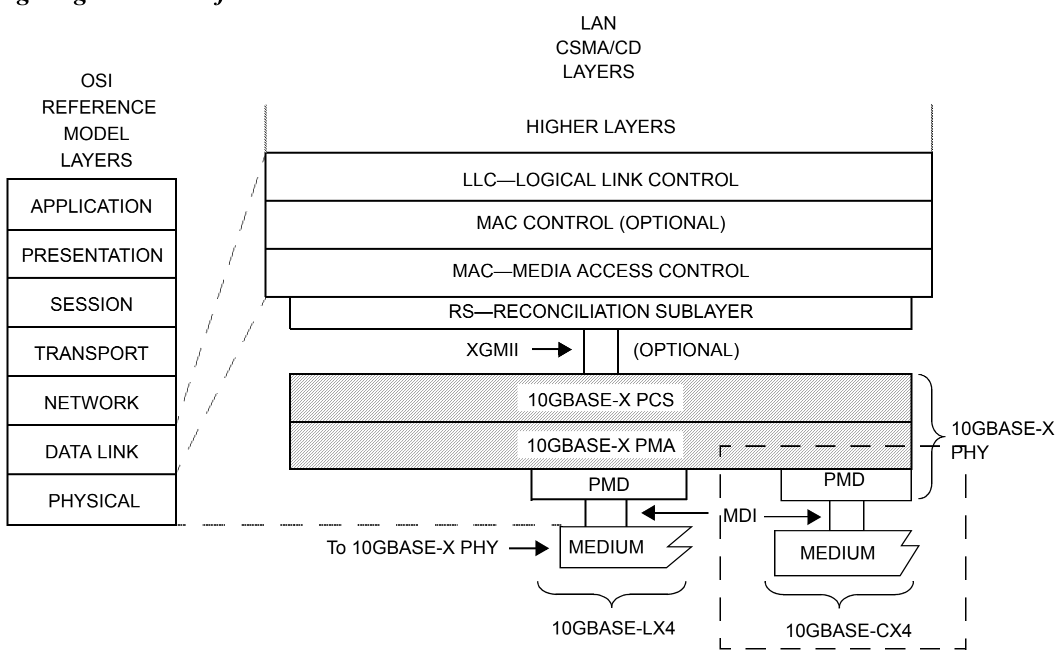
48.1 Overview

Change 1st paragraph in 48.1 to read as follows:

This clause specifies the Physical Coding Sublayer (PCS) and the Physical Medium Attachment (PMA) sublayer that are common to a family of 10 Gb/s Physical Layer implementations, collectively known as 10GBASE-X. The 10GBASE-LX4 PMD described in Clause 53 ~~is a member~~ and 10GBASE-CX4 described in Clause 54 are members of the 10GBASE-X PHY family. The term 10GBASE-X is used when referring to issues common to any of the variants within this family.

48.1.2 Relationship of 10GBASE-X to other standards

Change Figure 48-1 as follows:



MDI=MEDIUM DEPENDENT INTERFACE
PCS=PHYSICAL CODING SUBLAYER
PHY=PHYSICAL LAYER DEVICE
PMA=PHYSICAL MEDIUM ATTACHMENT
PMD=PHYSICAL MEDIUM DEPENDENT
XGMII=10GIGABIT MEDIA INDEPENDENT INTERFACE

Figure 48–1—10GBASE-X PCS and PMA relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE CSMA/CD LAN Model

48.1.3.3 Physical Medium Dependent (PMD) sublayer

Change 1st paragraph in 48.1.3.3 to read as follows:

10GBASE-X supports the PMD sublayer and MDI specified in Clause 53. The 10GBASE-LX4 ~~PMD performs~~ and 10GBASE-CX4 PMDs perform the following functions:

48.7.3 Major capabilities/options

Change the Table in 48.7.3 to read as follows:

Item	Feature	Subclause	Value/Comment	Status	Support
MD	MDIO	45, 48.1.3.1	Registers and interface supported	O	Yes [ ] No [ ]
XGXS	Support of XAUI/XGXS	47, 48.1.5		O	Yes [ ] No [ ]
XGE	XGMII compatibility interface	46, 48.1.3.1	Compatibility interface is supported	O	Yes [ ] No [ ]
LX4	Support of 10GBASE-LX4 PMD	53, 48.1.3.3		O	Yes [ ] No [ ]
CX4	Support of 10GBASE-CX4 PMD	54, 48.1.3.3		O	Yes [ ] No [ ]

54. Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-CX4

54.1 Overview

This clause specifies the 10GBASE-CX4 PMD (including MDI) and the baseband medium. In order to form a complete Physical Layer, the PMD shall be integrated with the appropriate physical sublayers (see Table 54–1) and with the management functions which are accessible through the Management Interface defined in Clause 45, all of which are hereby incorporated by reference.

Table 54–1—10GBASE-CX4 PMD type and associated physical layer clauses

Associated Clause	10GBASE-CX4
46— XGMII[a]	Optional
47—XGXS and XAUI	Optional
48—10GBASE-X PCS/PMA	Required

[a]The XGMII is an optional interface. However, if the XGMII is not implemented, a conforming implementation must behave functionally as though the RS and XGMII were present.

Figure 54–1 shows the relationship of the PMD and MDI sublayers to the ISO/IEC (IEEE) OSI reference model.

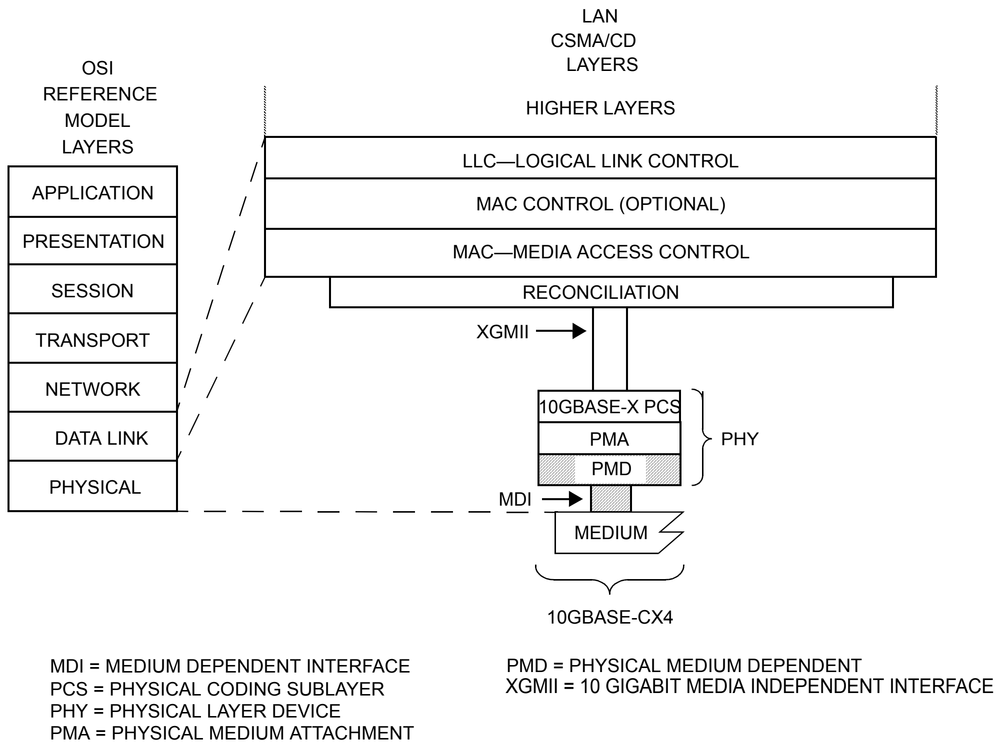


Figure 54–1—10GBASE-CX4 PMD relationship to the ISO/IEC Open Systems Interconnection (OSI) reference model and the IEEE 802.3 CSMA/CD LAN model

54.1.1 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the 10GBASE-CX4 PMD. The service interface for this PMD is described in an abstract manner and do not imply any particular implementation. The PMD Service Interface supports the exchange of encoded data between peer PMA entities. The PMD translates the encoded data to and from signals suitable for the specified medium.

The following PMD service primitives are defined:

PMD_UNITDATA.request

PMD_UNITDATA.indicate

PMD_SIGNAL.indicate

54.1.2 PMD_UNITDATA.request

This primitive defines the transfer of data (in the form of encoded 8B/10B characters) from the PMA to the PMD.

54.1.2.1 Semantics of the service primitive

PMD_UNITDATA.request (tx_bit <0:3>)

The data conveyed by PMD_UNITDATA.request is a continuous sequence of four parallel code-group streams, one stream for each lane. The tx_bit <0:3> correspond to the bits in the tx_lane<0:3> bit streams. Each bit in the tx_bit parameter can take one of two values: ONE or ZERO.

54.1.2.2 When generated

The PMA continuously sends four parallel code-group streams to the PMD at a nominal signaling speed of 3.125 GBaud.

54.1.2.3 Effect of Receipt

Upon receipt of this primitive, the PMD converts the specified stream of bits into the appropriate signals on the MDI.

54.1.3 PMD_UNITDATA.indicate

This primitive defines the transfer of data (in the form of encoded 8B/10B characters) from the PMD to the PMA.

54.1.3.1 Semantics of the service primitive

PMD_UNITDATA.indicate (rx_bit <0:3>)

The data conveyed by PMD_UNITDATA.indicate is a continuous sequence of four parallel encoded bit streams. The rx_bit<0:3> correspond to the bits in the rx_lane<0:3> bit streams. Each bit in the rx_bit parameter can take one of two values: ONE or ZERO.

54.1.3.2 When generated

The PMD continuously sends stream of bits to the PMA corresponding to the signals received from the MDI.

54.1.3.3 Effect of receipt

The effect of receipt of this primitive by the client is unspecified by the PMD sublayer.

54.1.4 PMD_SIGNAL.indicate

This primitive is generated by the PMD to indicate the status of the signals being received from the MDI.

54.1.4.1 Semantics of the service primitive

PMD_SIGNAL.indicate (SIGNAL_DETECT)

The SIGNAL_DETECT parameter can take on one of two values: OK or FAIL. When SIGNAL_DETECT = FAIL, rx_bit is undefined, but consequent actions based on PMD_UNITDATA.indicate, where necessary, interpret rx_bit as a logic ZERO.

NOTE—SIGNAL_DETECT = OK does not guarantee that rx_bit is known to be good. It is possible for a poor quality link to provide sufficient power for a SIGNAL_DETECT = OK indication and still not meet the 10^{-12} BER objective.

54.1.4.2 When generated

The PMD generates this primitive to indicate a change in the value of SIGNAL_DETECT.

54.1.4.3 Effect of receipt

The effect of receipt of this primitive by the client is unspecified by the PMD sublayer.

54.2 PCS and PMA functionality

The 10GBASE-CX4 PCS and PMA shall conform to the PCS and PMA defined in clause 48 unless otherwise noted herein.

54.3 Input / Output mapping

The 10GBASE-CX4 shall have the XAUI lane, as shown in Figure 47-2, to MDI connector pin mapping depicted in Table 54–2.

Table 54–2—XAUI lane to MDI connector pin mapping

XAUI Rx lane	MDI Connector pin	XAUI Tx lane	MDI Connector pin
DL0<p>	S1	SL0<p>	S16
DL0<n>	S2	SL0<n>	S15
DL1<p>	S3	SL1<p>	S14
DL1<n>	S4	SL1<n>	S13
DL2<p>	S5	SL2<p>	S12
DL2<n>	S6	SL2<n>	S11
DL3<p>	S7	SL3<p>	S10
DL3<n>	S8	SL3<n>	S9

54.4 Delay constraints

Predictable operation of the MAC Control PAUSE operation (Clause 31, Annex 31B) demands that there be an upper bound on the propagation delays through the network. This implies that MAC, MAC Control sublayer, and PHY implementers must conform to certain delay maxima, and that network planners and administrators conform to constraints regarding the cable topology and concatenation of devices.

The sum of transmit and receive delay contributed by the 10GBASE-CX4 PMD shall be no more than 512 BT (including 1 meter of cable).

54.5 PMD MDIO function mapping

The optional MDIO capability described in Clause 45 defines several variables that provide control and status information for and about the PMD. Mapping of MDIO control variables to PMD control variables is shown in Table 54–3. Mapping of MDIO status variables to PMD status variables is shown in Table 54–4.

Table 54–3—MDIO/PMD control variable mapping

MDIO control variable	PMA/PMD register name	Register/ bit number	PMD control variable
Reset	Control register 1	1.0.15	PMD_reset
Global transmit disable	Control register 1	1.9.0	Global_PMD_transmit_disable
Transmit disable 3	Transmit disable register	1.9.4	PMD_transmit_disable_3
Transmit disable 2	Transmit disable register	1.9.3	PMD_transmit_disable_2
Transmit disable 1	Transmit disable register	1.9.2	PMD_transmit_disable_1
Transmit disable 0	Transmit disable register	1.9.1	PMD_transmit_disable_0

Table 54–4—MDIO/PMD status variable mapping

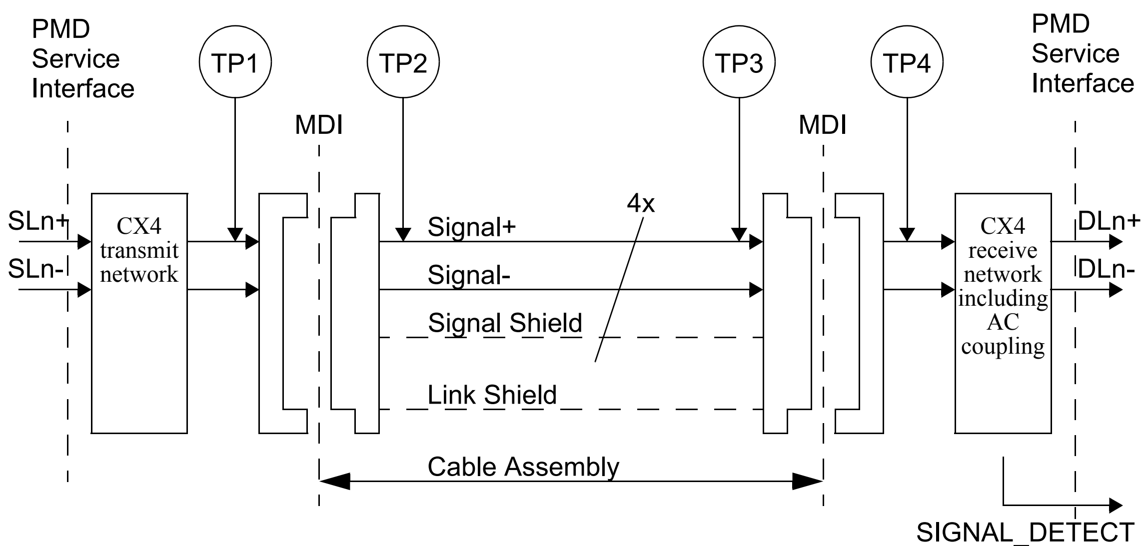
MDIO status variable	PMA/PMD register name	Register/ bit number	PMD status variable
Local fault	Status register 1	1.1.7	PMD_fault
Transmit fault	Status register 2	1.8.11	PMD_transmit_fault
Receive fault	Status register 2	1.8.10	PMD_receive_fault
Global PMD signal detect	Receive signal detect register	1.10.0	Global_PMD_signal_detect
PMD signal detect 3	Receive signal detect register	1.10.4	PMD_signal_detect_3
PMD signal detect 2	Receive signal detect register	1.10.3	PMD_signal_detect_2
PMD signal detect 1	Receive signal detect register	1.10.2	PMD_signal_detect_1
PMD signal detect 0	Receive signal detect register	1.10.1	PMD_signal_detect_0

54.6 PMD functional specifications

The 10GBASE-CX4 PMD performs the Transmit and Receive functions which convey data between the PMD service interface and the MDI plus various management functions if the optional MDIO is implemented.

54.6.1 PMD block diagram

The PMD block diagram is shown in Figure 54–2. For purposes of system conformance, the PMD sublayer is standardized at the points described in this subclause. The electrical transmit signal is defined at the output end of the mated connector (TP2). Unless specified otherwise, all transmitter measurements and tests defined in 54.7.3 are made at TP2. The electrical receive signal is defined at the output of the cabling mated connector (TP4). Unless specified otherwise, all receiver measurements and tests defined in 54.7.4 are made at TP3.



Note: SLn+ and SLn- are the positive and negative sides of the transmit differential signal pair and DLn+ and DLn- are the positive and negative sides of the receive differential signal pair for Lane n (n = 0, 1, 2, 3)

Figure 54–2—10GBASE-CX4 link (half link is shown)

54.6.2 PMD transmit function

The PMD Transmit function shall convert the four electronic bit streams requested by the PMD service interface message PMD_UNITDATA.request (tx_bit<0:3>) into four separate electrical signal streams. The four electrical signal streams shall then be delivered to the MDI, all according to the transmit electrical specifications in this clause. A positive output voltage of SLn+ minus SLn– (differential voltage) shall correspond to tx_bit = ONE.

54.6.3 PMD receive function

The PMD Receive function shall convert the four electrical signal streams from the MDI into four electronic bit streams for delivery to the PMD service interface using the message PMD_UNITDATA.indicate (rx_bit<0:3>), all according to the receive electrical specifications in this clause. A positive input voltage level in each signal stream of DLn+ minus DLn– (differential voltage) shall correspond to a rx_bit = ONE.

The PMD shall convey the bits received from the PMD_UNITDATA.request(tx_bit<0:3>) service primitive to the PMD service interface using the message PMD_UNITDATA.indicate(rx_bit<0:3>), where rx_bit<0:3> = tx_bit<0:3>.

54.6.4 Global PMD signal detect function

The Global_PMD_signal_detect function shall report the state of SIGNAL_DETECT via the PMD service interface. The SIGNAL_DETECT parameter is signaled continuously, while the PMD_SIGNAL.indicate message is generated when a change in the value of SIGNAL_DETECT occurs.

SIGNAL_DETECT shall be a global indicator of the presence of electrical signals on all four lanes. The PMD receiver is not required to verify whether a compliant 10GBASE-CX4 signal is being received, however, it shall be required to assert SIGNAL_DETECT = OK when the differential peak-to-peak voltage on each of the four lanes at the MDI has exceeded 175mVppd for at least 1 UI. The transition from SIGNAL_DETECT = FAIL to SIGNAL_DETECT = OK shall occur within 100µs after the condition for SIGNAL_DETECT = OK has been received.

The PMD receiver shall not assert SIGNAL_DETECT = FAIL until the differential peak-to-peak voltage on any of the four lanes at the MDI has dropped below 50mVppd and has remained below 50mVppd for at least 250µs. The PMD shall assert SIGNAL_DETECT = FAIL when the differential peak-to-peak voltage on any of the four lanes at the MDI has dropped below 50mVppd and has remained below 50mVppd for longer than 500µs.

Table 54–5—SIGNAL_DETECT summary

Parameter	Value	Units
SIGNAL_DETECT = OK level (maximum)	175	mVppd
SIGNAL_DETECT = OK width (minimum)	1	UI
SIGNAL_DETECT = OK assertion time (maximum)	100	µs
SIGNAL_DETECT = FAIL level (mimimum)	50	mVppd
SIGNAL_DETECT = FAIL de-assertion time maximum mimimum	 500 250	 µs µs

Note: The SIGNAL_DETECT=OK assertion time is recommended to be much faster than 100µs, however, this specification assumes measurement through the MII management interface and is thus limited by the sampling time required through that interface.

54.6.5 PMD lane by lane signal detect function

Various implementations of the Signal Detect function are permitted by this standard. When the MDIO is implemented, each PMD_signal_detect_n, where n represents the lane number in the range 0:3, value shall be continuously set in response to the amplitude of the receive signal on its associated lane, according to the requirements of section 54.6.4.

54.6.6 PMD reset function

If the MDIO interface is implemented, and if PMD_reset is asserted, the PMD shall be reset as defined in 45.2.1.1.1.

54.6.7 Global PMD transmit disable function

The Global_PMD_transmit_disable function is optional and allows all of the transmitters to be disabled.

a) When a Global_PMD_transmit_disable variable is set to ONE, this function shall turn off all of the transmitters such that each transmitter drives a constant logic level (i.e. no transitions) and meets the requirements of the absolute output voltage limits in Table 54–6.
b) If a PMD_fault is detected, then the PMD may set the Global_PMD_transmit_disable to ONE, turning off the electrical transmitter in each lane.
c) Loopback as defined in 54.6.9 shall not be affected by Global_PMD_transmit_disable.

54.6.8 PMD lane by lane transmit disable function

The PMD_transmit_disable_n function allows the electrical transmitters in each lane to be selectively disabled.

a) When a PMD_transmit_disable_n variable is set to ONE, this function shall turn off the transmitter associated with that variable such that each transmitter drives a constant logic level (i.e. no transitions) and meets the requirements of the absolute output voltage limits in Table 54–6.
b) If a PMD_fault is detected, then the PMD may set each PMD_transmit_disable_n to ONE, turning off the electrical transmitter in each lane.
c) Loopback as defined in 54.6.9 shall not be affected by PMD_transmit_disable_n.

If the PMD_transmit_disable_n function is not implemented in MDIO, an alternative method shall be provided to independently disable each transmit lane.

54.6.9 Loopback mode

Loopback mode shall be provided for the 10GBASE-CX4 as specified in this subclause, by the transmitter and receiver of a device as a test function to the device. When Loopback mode is selected by setting ~~either~~ the loopback control bit of 1.0.0 ~~or 3.0.14~~, transmission requests passed to the transmitter are shunted directly to the receiver, overriding any signal detected by the receiver on its attached link. A device is explicitly placed in Loopback mode (i.e., Loopback mode is not the normal mode of operation of a device). Loopback applies to all lanes as a group (i.e., the lane 0 transmitter is directly connected to the lane 0 receiver, the lane 1 transmitter is directly connected to the lane 1 receiver, etc.). The method of implementing Loopback mode is not defined by this standard.

Control of the Loopback function may be supported through the MDIO management interface of Clause 45 or equivalent.

NOTE—The signal path that is exercised in the Loopback mode is implementation specific, but it is recommended that this signal path encompass as much of the circuitry as is practical. The intention of providing this Loopback mode of operation is to permit diagnostic or self-test functions to test the transmit and receive data paths using actual data. Other loopback signal paths may also be enabled independently using loopback controls within other devices or sublayers.

54.6.10 PMD fault function

If the MDIO is implemented, and the PMD has detected a local fault on any of the transmit or receive paths, the PMD shall set PMD_fault to ONE.

54.6.11 PMD transmit fault function

If the MDIO is implemented, and the PMD has detected a local fault on any transmit lane, the PMD shall set the PMD_transmit_fault variable to ONE.

54.6.12 PMD receive fault function

If the MDIO is implemented, and the PMD has detected a local fault on any receive lane, the PMD shall set the PMD_receive_fault variable to ONE.

54.7 PMD to MDI Electrical specifications for 10GBASE-CX4

54.7.1 Signal levels

The 10GBASE-CX4 MDI is a low swing AC coupled differential interface. AC coupling allows for interoperability between components operating from different supply voltages. Low swing differential signaling provides noise immunity and improved electromagnetic interference (EMI).

54.7.2 Signal paths

The 10GBASE-CX4 MDI signal paths are point-to-point connections. Each path corresponds to a 10GBASE-CX4 MDI lane and is comprised of two complementary signals making a balanced differential pair. There are four differential paths in each direction for a total of eight pairs, or sixteen connections. The signal paths are intended to operate up to approximately 15m over standard twinaxial cables as described in 54.8.

54.7.3 Transmitter characteristics

Transmitter characteristics shall be measured at TP2, unless otherwise noted, and are summarized in Table 54–6 and detailed in the following subclauses.

Table 54–6—Driver characteristics' summary

Parameter	Subclause reference	Value	Units
Baud rate tolerance	54.7.3.3	3.125 GBd ± 100 ppm	GBd ppm
Unit interval nominal	54.7.3.3	320	ps
Differential peak amplitude maximum minimum	54.7.3.4	 1600 800	 mV_{pp} mV_{pp}
Common mode Signal+/- voltage limits maximum minimum	54.7.3.4	 1.9 –0.4	 V V
Differential output return loss minimum	54.7.3.5	[See Equation (54.1a) and (54.1b)]	dB
Differential output template	54.7.3.6	[See figure (54–6) and table (54–7)]	V
Transition time maximum minimum	54.7.3.7	 130 60	 ps ps
Output jitter Random jitter Deterministic jitter[a] Total jitter	54.7.3.8	 ± 0.090 peak from the mean ± 0.085 peak from the mean ± 0.175 peak from the mean	 UI UI UI

[a]Deterministic jitter is already incorporated into the differential output template.

54.7.3.1 Test Fixtures

The following fixture (illustrated by Figure 54–3), or its functional equivalent, shall be used for measuring the transmitter specifications described in 54.7.3. The transmitter under test includes the driver, pcb traces, any AC coupling components and the MDI connector described in 54.9.1

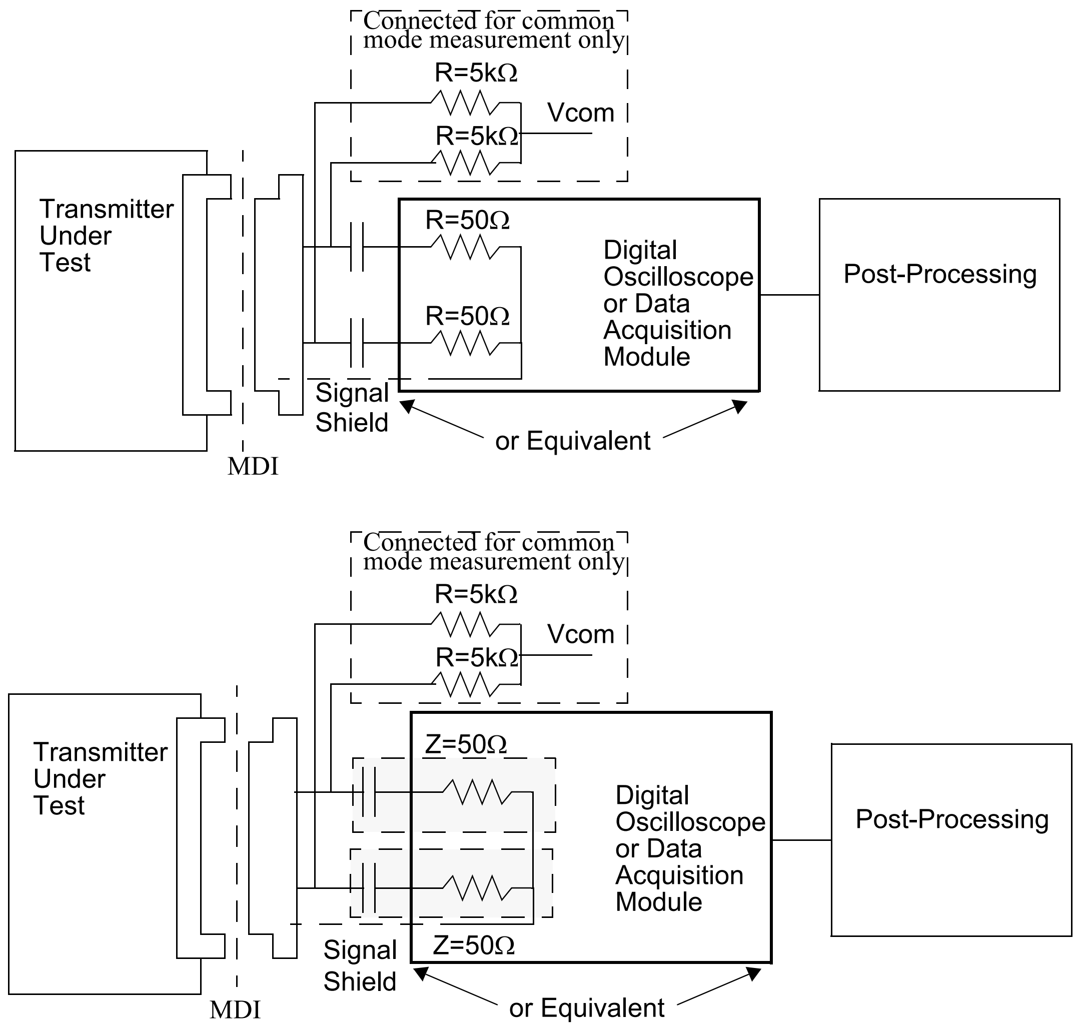


Figure 54–3—Transmit Test Fixture

54.7.3.2 Test Fixture Impedance

The test fixture impedance shall be 2 x 50Ω ± 1% to signal shield from 100 MHz to 2.0 GHz for these measurements, unless otherwise noted.

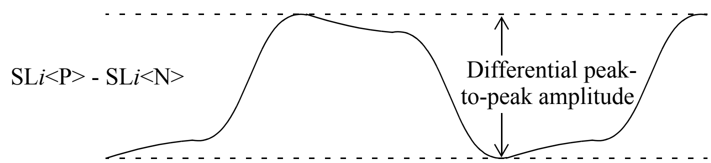
54.7.3.3 Baud rate tolerance

The 10GBASE-CX4 MDI Baud shall be 3.125 GBaud ±100 ppm. The corresponding Baud period is nominally 320 ps.

54.7.3.4 Amplitude and swing

Driver differential output amplitude shall be less than 1600 mV_{p-p}. The minimum differential peak to peak output voltage shall be greater than 800 mV_{p-p}. See Figure 54–4 for an illustration of definition of differential peak-to-peak amplitude.

DC-referenced logic levels are not defined since the receiver is AC coupled. The Signal+ / Signal- D.C. common mode voltage shall be between –0.4 V and 1.9 V with respect to Signal Shield as measured at Vcom in Figure 54–3.



Note: [SL*i*<P> and SL*i*<N> are the positive and negative sides of the differential signal pair for Lane *i* (*i*=0,1,2,3)]

Figure 54–4—Driver output voltage limits and definitions

54.7.3.5 Output impedance

For frequencies from 100 MHz to 2.0 GHz, the differential return loss, in dB with f in MHz, of the driver shall exceed Equation 54.1a and 54.1b. Differential return loss includes contributions from on-chip circuitry, chip packaging, and any off-chip components related to the driver. This output impedance requirement applies to all valid output levels. The reference impedance for differential return loss measurements is 100Ω.

$$ReturnLoss(f) \geq 10 \qquad \text{Eq. (54.1a)}$$

for 100 MHz <= f < 625 MHz and

$$ReturnLoss(f) \geq 10 - 10 \times \log\left(\frac{f}{625}\right) \qquad \text{Eq. (54.1b)}$$

for 625 MHz <= f < 2.0 GHz.

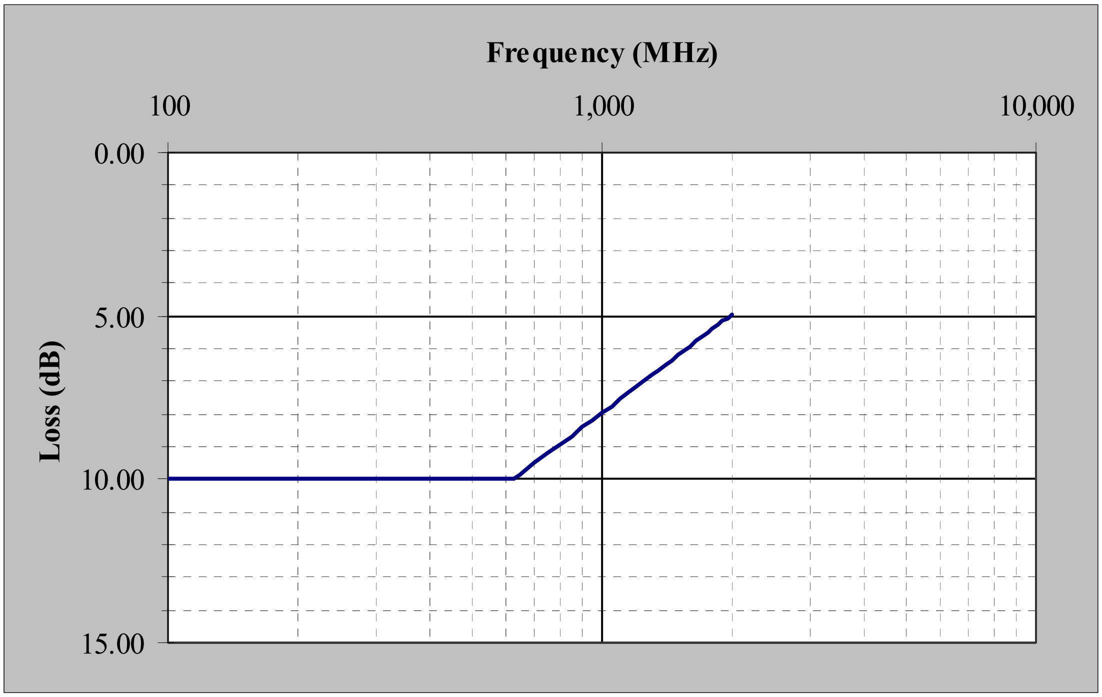


Figure 54–5—Transmit differential output return loss

54.7.3.6 Differential output template

The differential output template shall be tested using the low frequency test pattern specified in Annex 48A.2. The waveform under test shall be normalized by using the following procedure:

1) Align the output waveform under test, to achieve the best fit along the horizontal time axis.

2) Calculate the +1 low frequency level as Vlowp = average of any 2 continuous baud (640ps) between 800ps and 1760ps.

3) Calculate the -1 low frequency level as Vlowm = average of any 2 continuous baud (640ps) between 2400ps and 3360ps.

4) Calculate the vertical offset to be subtracted from the waveform as Voff = (Vlowp + Vlowm) / 2.

5) Calculate the vertical normalization factor for the waveform as Vnorm = (Vlowp - Vlowm) / 2.

6) Calculate the normalized waveform as: NormalizedWaveform = (OriginalWaveform - Voff) * (0.5 / Vnorm).

7) Align the normalized output waveform under test, to achieve the best fit along the horizontal time axis.

The normalized differential voltage waveform shall lie within the time domain template defined in Figure 54–6 and the piece-wise linear interpolation between the points in Table 54–7. These measurements are to be made for each pair while observing the differential signal output at the MDI using the transmitter test fixture.

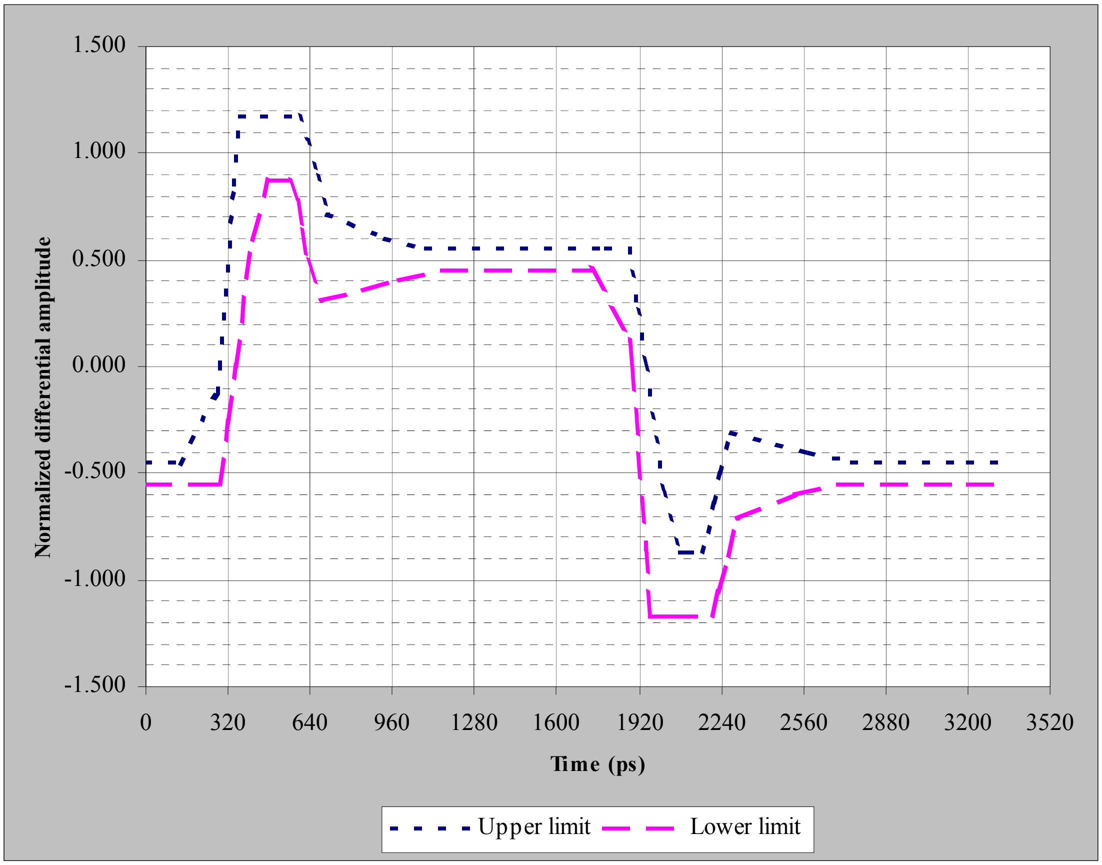


Figure 54–6—Normalized transmit template as measured at MDI using Figure 54–3

Table 54–7—Normalized transmit time domain template

Time (ps)	Upper limit	Time (ps)	Lower limit
0	-0.450	0	-0.550
131	-0.450	189	-0.550
283	-0.125	287	-0.550
283	-0.125	319	-0.266
291	0.000	349	0.000
343	0.850	414	0.586
363	1.175	477	0.870
451	1.175	509	0.870
602	1.175	565	0.870
629	1.060	591	0.776
669	0.888	611	0.635
709	0.715	631	0.494
709	0.715	685	0.306
931	0.600	989	0.400
1091	0.550	1149	0.450
1789	0.550	1731	0.450
1887	0.550	1883	0.125
1919	0.266	1883	0.125
1949	0.000	1891	0.000
2014	-0.586	1943	-0.850
2077	-0.870	1963	-1.175
2109	-0.870	2051	-1.175
2165	-0.870	2202	-1.175
2191	-0.776	2229	-1.060
2211	-0.635	2269	-0.888
2231	-0.494	2309	-0.715
2285	-0.306	2309	-0.715
2589	-0.400	2531	-0.600
2749	-0.450	2691	-0.550
3200	-0.450	3200	-0.550
3360	-0.450	3360	-0.550

NOTE—The ASCII for Table 54–7 is available from http://www.ieee802.org/3/publication/index.html.

Editor's note: NEED correct url

54.7.3.7 Transition time

Differential transition times shall be between 60 and 130 ps as measured between the 20% and 80% levels while transmitting the pattern defined by 48A.1. Faster transitions may result in excessive high-frequency components and increase EMI and crosstalk.

54.7.3.8 Transmit jitter

The transmitter shall satisfy the jitter requirements with a maximum total jitter of ± 0.175 UI peak from the mean, a maximum deterministic component of ± 0.085 UI peak from the mean and a random component of ± 0.09 UI peak from the mean. Note that these values assume symmetrical jitter distributions about the mean. If a distribution is not symmetrical, its peak-to-peak total jitter value must be less than these total jitter values to claim compliance. Jitter specifications include all but 10^{-12} of the jitter population.

Editor's Note: The transmitter jitter allocation is a subject for analysis and will be reconsidered at the March 2003 Plenary.

54.7.4 Receiver characteristics

Receiver characteristics are summarized in Table 54–8 and detailed in the following subclauses.

Table 54–8—Receiver characteristics' summary

Parameter	Subclause reference	Value	Units
Bit error ratio	54.7.4.1	10^{-12}	
Baud rate tolerance	54.7.4.2	3.125 ±100	GBd ppm
Unit interval (UI) nominal	54.7.4.2	320	ps
Receiver coupling	54.7.4.3	AC	
Differential input amplitude (maximum)	54.7.4.4	1600	mVpp
Return loss[a] differential (minimum)	54.7.4.5	10	dB
Jitter tolerance	54.7.4.6	[See figure (54–8)]	UI

[a]Relative to 100 Ω differential.

54.7.4.1 Bit error ratio

The receiver shall operate with a BER of better than 10^{-12} in the presence of a compliant transmit signal, as defined in 54.7.3, and a compliant channel as defined in 54.8.

54.7.4.2 Baud rate tolerance

A 10GBASE-CX4 receiver shall tolerate a baud rate of 3.125GBd ±100 ppm.

54.7.4.3 AC coupling

The 10GBASE-CX4 receiver shall be AC coupled to the cable assembly to allow for maximum interoperability between various 10 Gbps components. AC coupling is considered to be part of the receiver for the purposes of this specification unless explicitly stated otherwise. It should be noted that there may be various methods for AC coupling in actual implementations.

Note: It is recommended that the maximum value of the coupling capacitors be limited to 470pF. This will limit the inrush currents to the receiver, that could damage the receiver circuits when repeatedly connected to transmit modules with a higher voltage level.

54.7.4.4 Input signal amplitude

10GBASE-CX4 receivers shall accept differential input signal amplitudes produced by compliant transmitters connected without attenuation to the receiver. Note that this may be larger than the 1600 mV_{pp} differential maximum of 54.7.3.3 due to actual driver and receiver input impedances. The minimum input amplitude is defined by the transmit driver, the channel and the actual receiver input impedance. Note that the transmit driver is defined using a well controlled load impedance. The minimum signal amplitude into an actual receiver may vary from the minimum height due to the actual receiver input impedance. Since the 10GBASE-CX4 receiver is AC coupled, the absolute voltage levels with respect to the receiver ground are dependent on the receiver implementation.

54.7.4.5 Input impedance

For frequencies from 100 MHz to 2.0 GHz, the differential return loss, in dB with f in MHz, of the receiver shall exceed Equation 54.2a and 54.2b. Differential return loss includes contributions from on-chip circuitry, chip packaging, and any off-chip components related to the driver. This output impedance requirement applies to all valid output levels. The reference impedance for differential return loss measurements is 100Ω.

$$ReturnLoss(f) \geq 10 \qquad \text{Eq. (54.2a)}$$

for 100 MHz <= f < 625 MHz and

$$ReturnLoss(f) \geq 10 - 10 \times \log\left(\frac{f}{625}\right) \qquad \text{Eq. (54.2b)}$$

for 625 MHz <= f < 2.0 GHz.

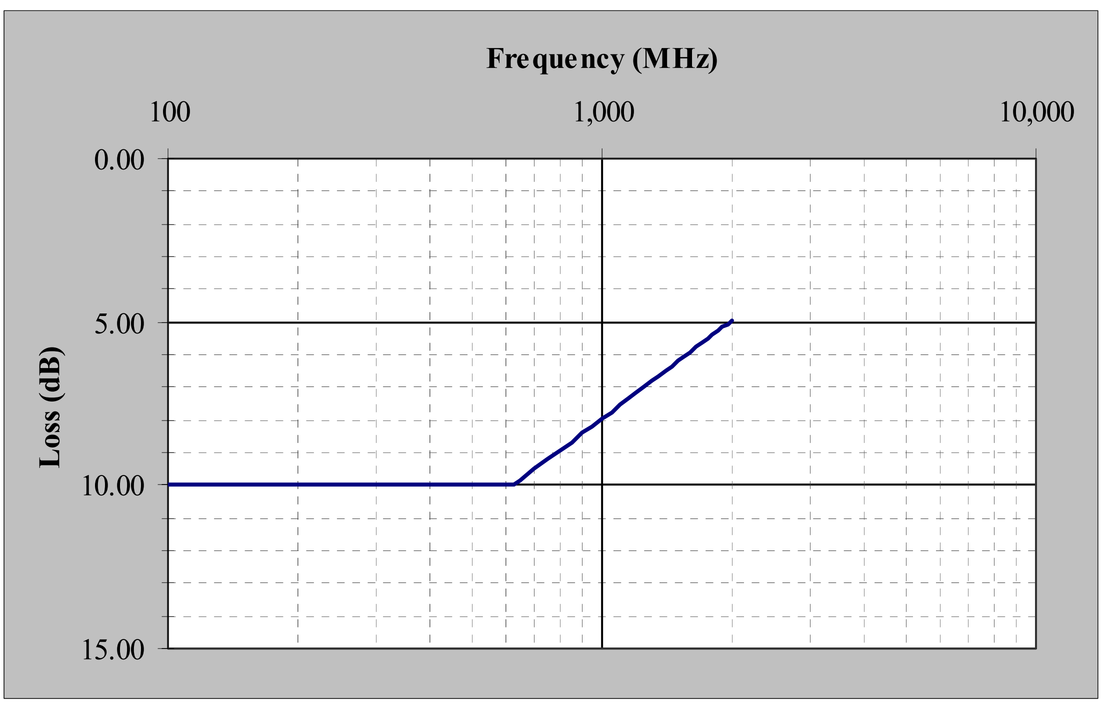


Figure 54–7—Receiver differential input return loss

54.7.4.6 Jitter tolerance

The total jitter is composed of three components: deterministic jitter, random jitter, and an additional sinusoidal jitter. The receiver shall tolerate the maximum deteministic, random and total jitter as defined in 54.7.3.8 with any compliant transmit signal, as defined in 54.7.3 through any compliant channel as defined in 54.8. The receiver shall tolerate an additional sinusoidal jitter with any frequency and amplitude defined by the mask of Figure 54–8. This additional component is intended to ensure margin for low-frequency jitter, wander, noise, crosstalk and other variable system effects. Jitter specifications include all but 10^{-12} of the jitter population. Jitter tolerance test requirements are specified in 54.10.1.

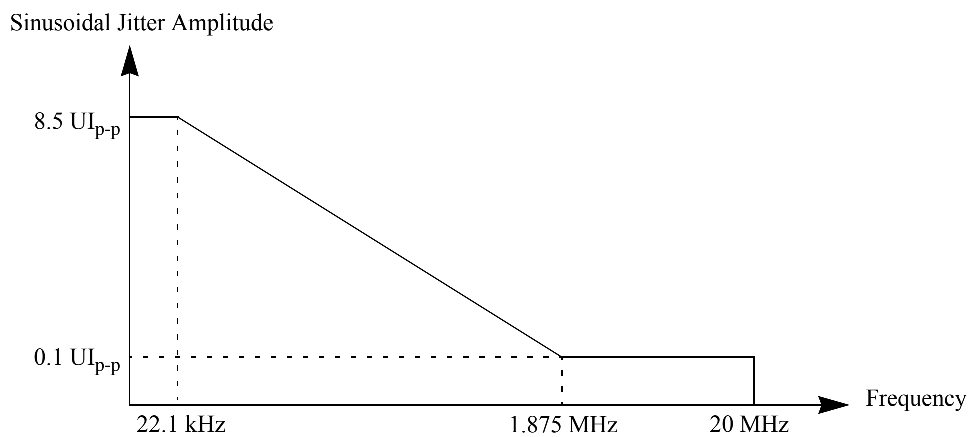


Figure 54–8—Single-tone sinusoidal jitter mask

54.8 Cable assembly characteristics

The 10GBASE-CX4 is primarily intended as a point-to-point interface of up to approximately 15 m between integrated circuits using controlled impedance cables. Loss and jitter budgets are presented in Table 54–9.

Table 54–9—Informative 10GBASE-CX4 loss and jitter budget

	Loss (dB) @ 1.5625 GHz	Total jitter (UI_{p-p})[a]	Random jitter (UI_{p-p})[a]	Deterministic jitter (UI_{p-p})[a]
Driver & package	0	0.35	0.18	0.17
PCBs[b]	1.0	0.02		0.02
Cable Assembly	16.5	0.18[c]		0.18
Other[d]	1.0	0.10		0.10
Total	18.5	0.65	0.18	0.47

[a]Jitter specifications include all but 10^{-12} of the jitter population.
[b]Loss is for 5.08cm of FR4 on each end of the link.
[c]The cable assembly jitter due to ISI may be larger than indicated and equalization is expected to limit to the indicated amount.
[d]Includes such effects as crosstalk, noise, and interaction between jitter and eye height.

Table 54–10—Cable assembly differential characteristics' summary

Description	Reference	Value	Unit
Characteristic Impedance @ TP2/TP3[a]	54.8.1	100 ± 10	Ω
Insertion loss at 1.5625 GHz (max.)	54.8.2 & 54.8.3	16.5	dB
Return loss at 1.5625 GHz (max.)	54.8.3	11.4	dB
Minimum NEXT loss at 1.5625 GHz (max.)	54.8.4.1	31.8	dB
Minimum MDNEXT loss at 1.5625 GHz (max.)	54.8.4.2	26.8	dB
Minimum ELFEXT loss at 1.5625 GHz (max.)	54.8.5.1	22.1	dB
Minimum MDELFEXT loss at 1.5625 GHz (max.)	54.8.5.2	20.1	dB

[a]The link impedance measurement identifies the impedance mismatches present in the cable assembly when terminated in its characteristic impedance. This measurement includes mated connectors at both ends of the Jumper cable assembly (points TP2 and TP3). The impedance for the jumper cable assembly, shall be recorded 4.0 ns following the reference location determined by an open connector at TP2 and TP3.

54.8.1 Characteristic impedance

The recommended differential characteristic impedance of circuit board trace pairs and the cable assembly is 100 Ω ± 10% from 100 MHz to 2.0 GHz.

54.8.2 Cable assembly insertion loss

The insertion loss, in dB with f in MHz, of each pair of the 10GBASE-CX4 cable assembly shall be:

$$InsertionLoss(f) \leq (0.2629 \cdot \sqrt{f}) + (0.0034 \cdot f) + \left(\frac{12.76}{\sqrt{f}}\right) + 0.5 \quad \text{Eq. (54.3)}$$

for all frequencies from 100 MHz to 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

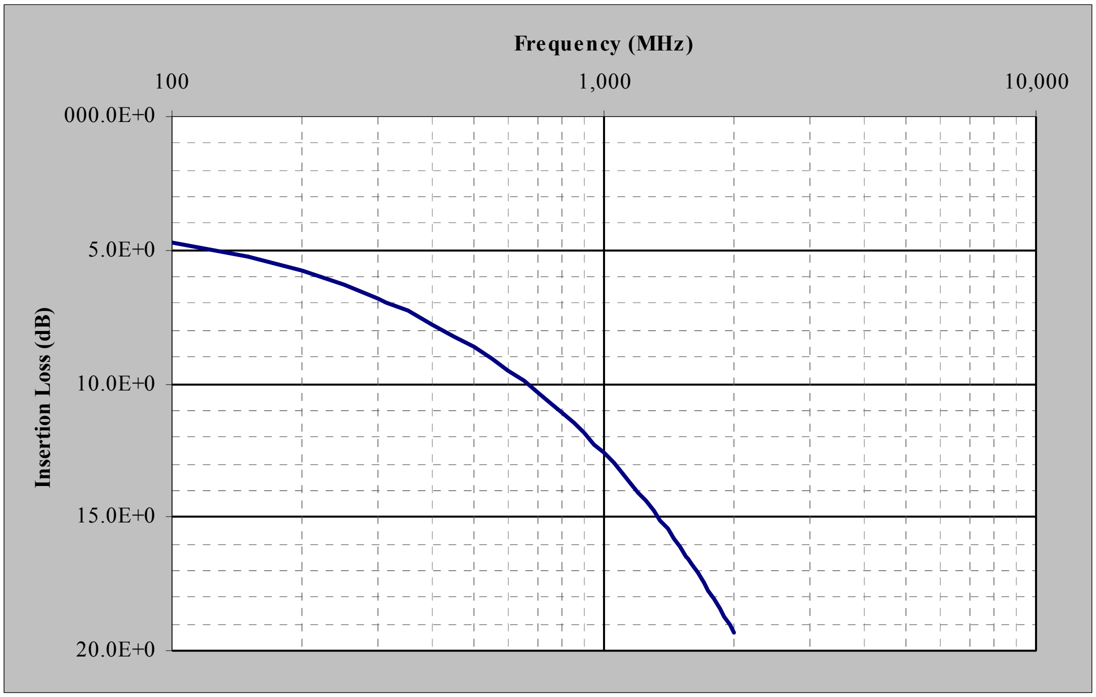


Figure 54–9—Cable assembly insertion loss

54.8.3 Cable assembly return loss

The return loss, in dB with f in MHz, of each pair of the 10GBASE-CX4 cable assembly shall be:

$$ReturnLoss(f) \geq 20 - 17.7 \times \log\left(\frac{f}{100}\right) \quad \text{Eq. (54.4a)}$$

for 100 MHz <= f < 500 MHz.

$$ReturnLoss(f) \geq 8 \quad \text{Eq. (54.4b)}$$

for 500 MHz <= f < 1000 MHz.

$$ReturnLoss(f) \geq 8 + 17.3 \times \log\left(\frac{f}{1000}\right) \quad \text{Eq. (54.4c)}$$

for 1000 MHz <= f < 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

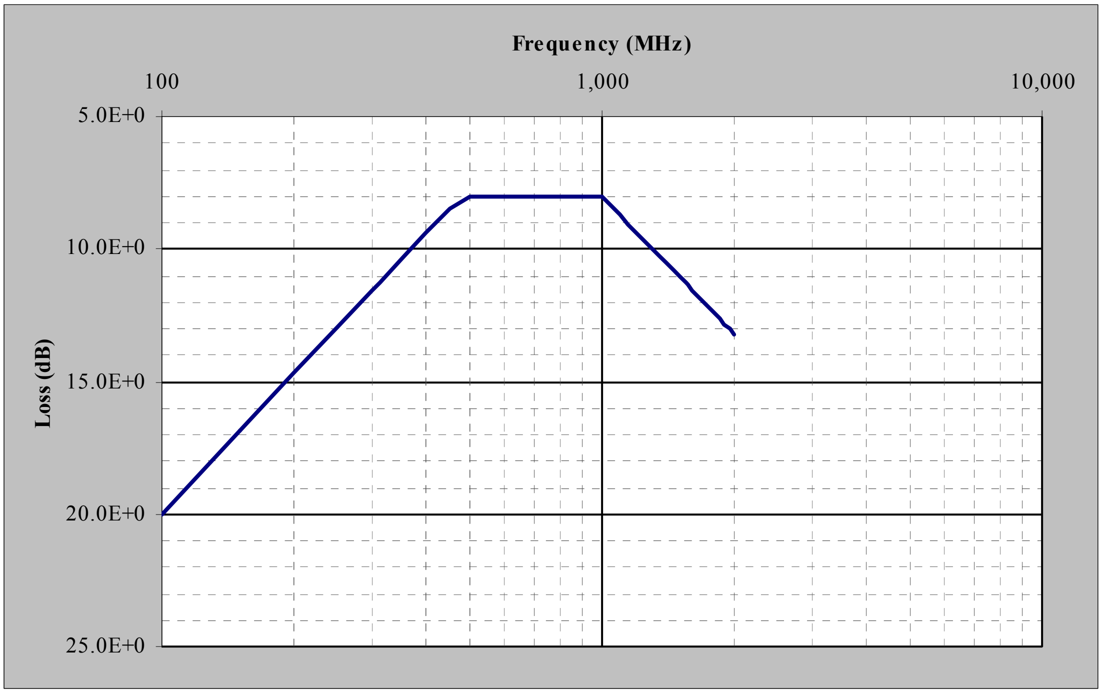


Figure 54–10—Cable assembly return loss

54.8.4 Near-End Crosstalk (NEXT)

54.8.4.1 Differential Near-End Crosstalk

In order to limit the crosstalk at the near end of a link segment, the differential pair-to-pair Near-End Crosstalk (NEXT) loss between the any of the four transmit channels and any of the four recieve channels is specified to meet the bit error rate objective specified in 54.7.4.1. The NEXT loss between any transmit and receive channel of a link segment, in dB with f in MHz, shall be at least

$$NEXT(f) \geq 30 - 17 \times \log\left(\frac{f}{2000}\right) \qquad \text{Eq. (54.5)}$$

for all frequencies from 100 MHz to 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

54.8.4.2 Multiple Disturber Near-End Crosstalk (MDNEXT)

Since four transmit and four recieve channels are used to transfer data between PMDs, the NEXT that is coupled into a receive channel will be from the four transmit channels. To ensure the total NEXT coupled into a receive channel is limited, multiple disturber NEXT loss is specified as the power sum of the individual NEXT losses.

The Power Sum loss between a receive channel and the four transmit channels, in dB with f in MHz, shall be at least

$$MDNEXT(f) \geq 25 - 17 \times \log\left(\frac{f}{2000}\right) \qquad \text{Eq. (54.6)}$$

for all frequencies from 100 MHz to 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

MDNEXT loss is determined by summing the magnitude of the four individual pair-to-pair differential NEXT loss values over the frequency range 100 MHz to 2.0 GHz as follows:

$$\text{MDNEXT\_Loss(f)} = -10\log_{10}\sum_{i=0}^{i=3} 10^{-(NL(f)i)/10} \qquad \text{Eq. (54.7)}$$

where

NL(f)i is the magnitude of NEXT loss at frequency f of pair combination i

i is the 0, 1, 2, or 3 (pair-to-pair combination)

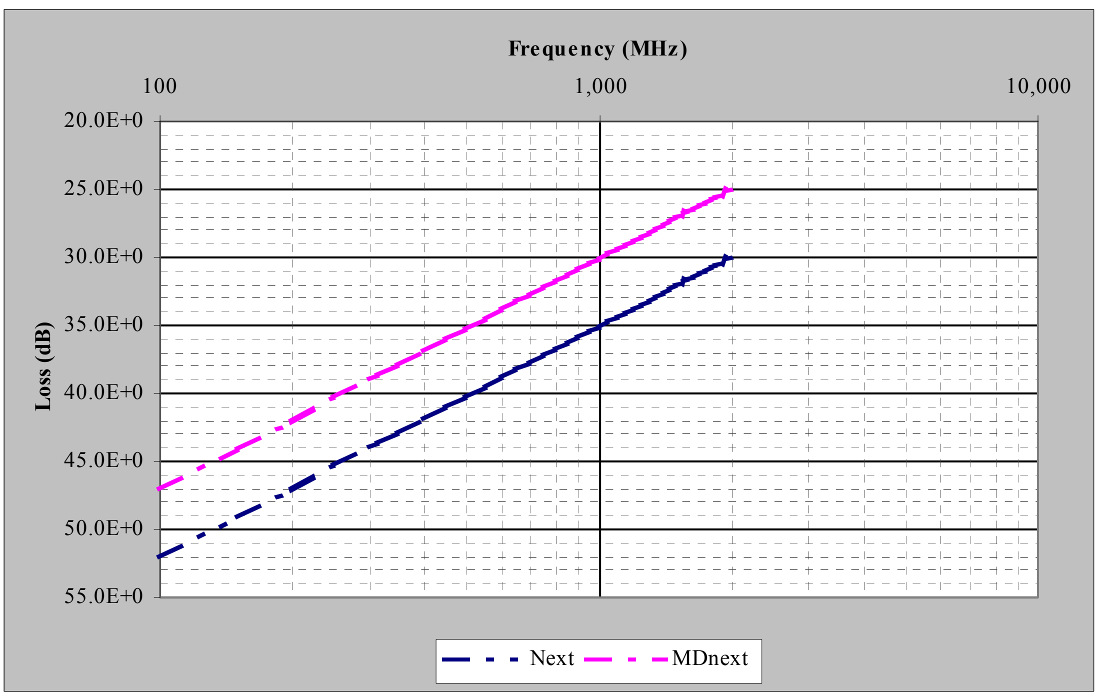


Figure 54–11—Cable assembly NEXT / MDNEXT loss

54.8.5 Far-End Crosstalk (FEXT)

54.8.5.1 Equal Level Far-End Crosstalk (ELFEXT) loss

Equal Level Far-End Crosstalk (ELFEXT) loss is specified in order to limit the crosstalk at the far end of each link segment duplex channel and meet the BER objective specified in 54.7.4.1. Far-End Crosstalk

(FEXT) is crosstalk that appears at the far end of a duplex channel (disturbed channel), which is coupled from another duplex channel (disturbing channel) with the noise source (transmitters) at the near end. FEXT loss is defined as

$$FEXT\_Loss(f) = 20\log_{10}[Vpds(f)/Vpcn(f)]$$

and ELFEXT_Loss is defined as

$$ELFEXT\_Loss(f) = 20\log_{10}[Vpds(f)/Vpcn(f)] - SLS\_Loss(f)$$

where

Vpds	is the peak voltage of disturbing signal (near-end transmitter)
Vpcn	is the peak crosstalk noise at far end of disturbed channel
SLS_Loss	is the insertion loss of disturbed channel in dB

The worst pair ELFEXT loss between any two duplex channels shall be at least:

$$ELFEXT(f) \geq 20 - 20 \times \log\left(\frac{f}{2000}\right) \quad \text{Eq. (54.8)}$$

for all frequencies from 100 MHz to 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

54.8.5.2 Multiple Disturber Equal Level Far-End Crosstalk (MDELFEXT) loss

Since four duplex channels are used to transfer data between PMDs, the FEXT that is coupled into a data carrying channel will be from the three adjacent disturbing duplex channels. This specification is consistent with three channel-to-channe. To ensure the total FEXT coupled into a duplex channel is limited, multiple disturber ELFEXT loss is specified as the power sum of the individual ELFEXT losses.

The Power Sum loss between a duplex channel and the three adjacent disturbers shall be at least:

$$MDELFEXT(f) \geq 18 - 20 \times \log\left(\frac{f}{2000}\right) \quad \text{Eq. (54.9)}$$

for all frequencies from 100 MHz to 2.0 GHz. This includes the attenuation of the differential cabling pairs, and the assembly connector.

54.8.5.2.1 Multiple-Disturber Power Sum Equal Level Far-End Crosstalk (PSELFEXT) loss

PSELFEXT loss is determined by summing the magnitude of the three individual pair-to-pair differential ELFEXT loss values over the frequency range 100 MHz to 2.0 GHz as follows:

$$PSELFEXT(\mathrm{f}) = -10\log_{10}\sum_{i=1}^{i=3} 10^{-(NL(f)i)/10} \quad \text{Eq. (54.10)}$$

where

NL(*f*)i is the magnitude of FEXT loss at frequency *f* of pair combination i
i is the 1, 2, or 3 (pair-to-pair combination)

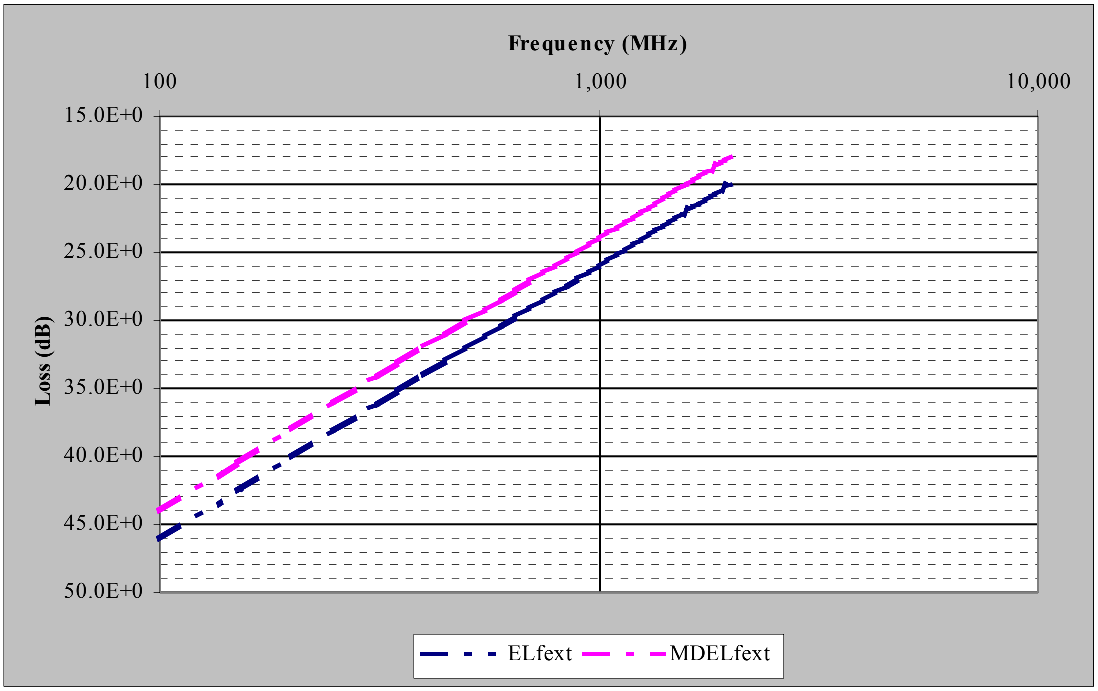


Figure 54–12—Cable assembly ELFEXT / MDELFEXT loss

54.8.6 Shielding

The cable assembly shall provide class 2 or better shielding in accordance with IEC 61196-1.

54.9 MDI specification

This sub-clause defines the Media Dependent Interface (MDI). The 10GBASE-CX4 PMD of 54.7 is coupled to the cable assembly of 54.8 by the media dependent interface (MDI).

54.9.1 MDI connectors

Connectors meeting the requirements of 54.9.1.1 shall be used as the mechanical interface between the PMD of 54.7 and the cable assembly of 54.8. The MDI connector shall be used on the cable assembly and the MDI receptacle on the PHY.

54.9.1.1 Connector specification

The connector for the cable assemblies shall be the latch type with the mechanical mating interface defined by SFF-8470, having pinouts matching those in Table 54–2, and the signal quality and electrical requirements of 54.7 and 54.8.

Editor's Note: replace SFF-8470 with IEC number prior to final approval.

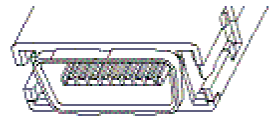


Figure 54–13—Example MDI connector

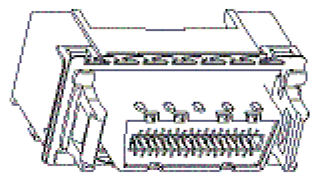
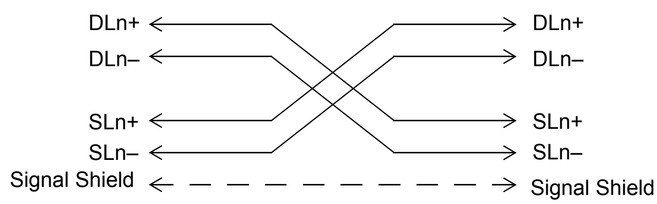


Figure 54–14—Example MDI receptacle

54.9.2 Crossover function

The default cable assembly shall be wired in a crossover fashion as shown in Figure 54–15, with each of the four pairs being attached to the transmitter contacts at one end and the receiver contacts at the other end.



Note: [SL*i*<P> and SL*i*<N> are the positive and negative sides of the differential signal pair for Lane *i* (*i*=0,1,2,3)]

Figure 54–15—Cable wiring

54.10 Electrical measurement requirements

54.10.1 Jitter test requirements

For the purpose of jitter measurement, the effect of a single-pole high pass filter with a 3 dB point at 1.875 MHz is applied to the jitter. The data pattern for jitter measurements is the CJPAT pattern defined in Annex 48A. All four lanes of the 10GBASE-CX4 transciever are active in both directions, and opposite ends of the link use asynchronous clocks. Jitter is measured with AC coupling and at 0 volts differential. Jitter measurement for the transmitter (or for calibration of a jitter tolerance setup) shall be performed with a test procedure resulting in a BER bathtub curve such as that described in Annex 48B.

54.10.1.1 Transmit jitter

Transmit jitter is measured at the MDI output when terminated into the load specified in 54.7.3.2.

54.10.1.2 Jitter tolerance

Jitter tolerance is measured at the receiver using a jitter tolerance test signal. This signal is obtained by first producing the required sum of deterministic and random jitter defined in 54.7.4.6 on any compliant transmit output waveform as define in 54.7.3.6 and then passing the signal through any compliant cable assembly as defined in 54.8.2. Random jitter is calibrated using a high pass filter with a low-frequency corner of 20 MHz and 20 dB/decade rolloff. The required sinusoidal jitter specified in 54.7.4.6 is then added to the signal and the far-end load is replaced by the receiver being tested.

54.11 Environmental specifications

All equipment subject to this clause shall conform to the applicable requirements of 14.7 and applicable sections of ISO/IEC 11801: 1995.

54.12 Protocol Implementation Conformance Statement (PICS) proforma for Clause 54., Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-CX4[1]

54.12.1 Introduction

The supplier of a protocol implementation that is claimed to conform to IEEE Std 802.3ak-2003, Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-CX4, shall complete the following Protocol Implementation Conformance Statement (PICS) proforma. A detailed description of the symbols used in the PICS proforma, along with instructions for completing the PICS proforma, can be found in Clause 21.

[1]*Copyright release for PICS proformas:* Users of this standard may freely reproduce the PICS proforma in this annex so that it can be used for its intended purpose and may further publish the completed PICS.

54.12.2 Identification

54.12.2.1 Implementation identification

Supplier[1]	
Contact point for enquiries about the PICS[1]	
Implementation Name(s) and Version(s)[1,3]	
Other information necessary for full identification—e.g., name(s) and version(s) for machines and/or operating systems; System Name(s)[2]	
NOTES 1—Required for all implementations. 2—May be completed as appropriate in meeting the requirements for the identification. 3—The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).	

54.12.2.2 Protocol summary

Identification of protocol standard	IEEE Std 802.3ak-2003, Clause 54., Physical Medium Dependent (PMD) sublayer and baseband medium, type 10GBASE-CX4
Identification of amendments and corrigenda to this PICS proforma that have been completed as part of this PICS	
Have any Exception items been required? No [ ] Yes [ ] (See Clause 21; the answer Yes means that the implementation does not conform to IEEE Std 802.3ak-2003.)	

Date of Statement	

54.12.3 PICS proforma tables for 10GBASE-CX4 and baseband medium

54.12.3.1 Compatibility considerations

Item	Feature	Subclause	Value/Comment	Status	Support
CC1	Jitter test patterns	54.10.1	As per Annex 48A	M	Yes [ ]
CC2	Environmental specifications	54.11		M	Yes [ ]

54.12.4 Major capabilities / options

Item	Feature	Subclause	Value/Comment	Status	Support
CX4	10GBASE-CX4 PMD	54.1		O	Yes [ ] No [ ]
MC1	XGMII interface	54.1	Device integrates Clause 46 XGMII interface?	O	Yes [ ] No [ ]
MC2	XGXS & XAUI	54.1	Device integrates Clause 47 XGXS and XAUI interface?	O	Yes [ ] No [ ]
MC3	10GBASE-X PCS/PMA	54.1, 54.2	Device integrates Clause 48 10GBASE-X PCS/PMA?	M	Yes [ ]
MC4	XAUI lane to MDI lane assignment	54.3	Device supports connector pin assignments in Table 54–2	M	Yes [ ]
DC	Delay constraints	54.4	Delay no more than 512 BT	M	Yes [ ]
*MD	MDIO capability	54.5	Registers and interface supported	O	Yes [ ] No [ ]
TP1	Standardized reference point TP1 exposed and available for testing	54.6.1	This point may be made available for use by implementers to certify component conformance	O	Yes [ ] No [ ]
TP4	Standardized reference point TP4 exposed and available for testing	54.6.1	This point may be made available for use by implementers to certify component conformance	O	Yes [ ] No [ ]

54.12.4.1 PMD Functional specifications

Item	Feature	Sub clause	Value/Comment	Status	Support
PF1	Transmit function	54.6.2	Convey bits requested by PMD_UNITDATA.request() to the MDI	M	Yes [ ]
PF2	Delivery to the MDI	54.6.2	Supplies electrical signal streams for delivery to the MDI	M	Yes [ ]
PF3	Mapping between electrical signal and logical signal for transmitter	54.6.2	A positive differential votlage is a one	M	Yes [ ]
PF4	Receive function	54.6.3	Convey bits received from the MDI to PMD_UNITDATA.indicate(rx_bit<0:3>)	M	Yes [ ]
PF5	Conversion of four electrical signals to four electrical signals	54.6.3	Converts the four electrical signal streams into four electrical bit streams for delivery to the PMD service interface	M	Yes [ ]
PF6	Mapping between electrical signal and logical signal for receiver	54.6.3	A positive differential voltage is a one	M	Yes [ ]
PF7	Receive function behavior	54.6.3	Conveys bits from PMD service primitive to the PMD service interface	M	Yes [ ]
PF8	Global PMD Signal Detect function	54.6.4	Report to the PMD service interface the message PMD_SIGNAL.indicate(SIGNAL_DETECT)	M	Yes [ ]
PF11	Global PMD Signal Detect behavior	54.6.4	SIGNAL_DETECT is a global indicator of the presence of electrical signals on all four lanes	M	Yes [ ]
PF12	Global PMD Signal Detect OK threshold	54.6.4	SIGNAL_DETECT = OK for signal value >= 175mVppd for at least 1 UI	M	Yes [ ]
PF13	Global PMD Signal Detect OK response	54.6.4	SIGNAL_DETECT = OK indicated within 100µs	M	Yes [ ]
PF14	Global PMD Signal Detect FAIL threshold	54.6.4	SIGNAL_DETECT = FAIL for signal level < 50mVppd for 250µs to 500µs	M	Yes [ ] No [ ]
PF16	Lane-by-Lane Signal Detect function	54.6.5	Sets PMD_signal_detect_n values on a lane-by-lane basis per requirements of section 54.6.4	MD:M	Yes [ ] No [ ] NA [ ]
PF17	PMD_reset function	54.6.6	Resets the PMD sublayer	MD:M	Yes [ ] No [ ] NA [ ]
PF18	Loop Back	54.6.9	Loopback function provided	M	Yes [ ]

54.12.4.2 Management functions

Item	Feature	Subclause	Value/Comment	Status	Support
MF1	Management register set	54.5		MD:M	Yes [ ] N/A [ ]
MF2	Global_PMD_transmit_disable	54.6.7	Disables all transmitters by forcing a constant output state	MD:O	Yes [ ] No [ ] NA [ ]
MF3	PMD_fault disables transmitter	54.6.7	Disables all transmitters by forcing a constant output state when a fault is detected	MD:O	Yes [ ] No [ ] NA [ ]
MF4	Effect on loopback of Global_PMD_transmit_disable	54.6.7	Global_PMD_transmit_disable does not affect loopback function	MD:M	Yes [ ] No [ ] NA [ ]
MF5	PMD_transmit_disable_n	54.6.8	Disables transmitter n (n=0:3) by forcing a constant output state	M	Yes [ ] No [ ]
MF6	PMD_fault disables transmitter n	54.6.8	Disables transmitter n (n=0:3) by forcing a constant output state when a fault is detected	O	Yes [ ] No [ ] NA [ ]
MF7	Effect on loopback of PMD_transmit_disable_n	54.6.8	PMD_transmit_disable_n does not affect loopback function	M	Yes [ ] No [ ] NA [ ]
MF8	PMD_fault function	54.6.10	Sets PMD_fault to a logical 1 if any local fault is detected	MD:M	Yes [ ] No [ ]
MF9	PMD_transmit_fault function	54.6.11	Sets PMD_transmit_fault_n to a logical 1 if a local fault is detected on the transmit path x	MD:M	Yes [ ] No [ ]
MF10	PMD_receive_fault function	54.6.12	Sets PMD_receive_fault_x to a logical 1 if a local fault is detected on the receive path x	MD:M	Yes [ ] No [ ]

54.12.4.3 Transmitter specifications

Item	Feature	Subclause	Value/Comment	Status	Support
DS1	Test performed at TP2	54.7.3		M	Yes [ ]
DS2	Test ficture	54.7.3.1	Test ficture of Figure 54–3 or equivalent used	M	Yes [ ]
DS3	Test load	54.7.3.2	2 x 50 ohm load used	M	Yes [ ]
DS4	Baud Rate	54.7.3.3	3.125GBd ± 100ppm	M	Yes [ ]
DS5	Maximum driver output amplitude	54.7.3.4	Less than 1600 mVppd	M	Yes [ ]
DS6	Minimum peak driver output amplitude	54.7.3.4	Greater than 800mVppd	M	Yes [ ]
DS7	Common mode output voltage	54.7.3.4	Between –0.4 and +1.9 V	M	Yes [ ]
DS8	Driver output impedance	54.7.3.5	Per Eq. (54.1a) and Eq. (54.1b)	M	Yes [ ]
DS9	Driver output template test pattern	54.7.3.6	Per 48A.2	M	Yes [ ]
DS10	Driver output normalization	54.7.3.6	Per process defined in 54.7.3.6	M	Yes [ ]
DS11	Driver output template	54.7.3.6	Lies within template	M	Yes [ ]
DS12	Transition time	54.7.3.7	Between 60-130ps	M	Yes [ ]
DS13	Jitter test requirements	54.10.1	Meet BER bathtub curve, See Annex 48B	M	Yes [ ]
DS14	Total jitter	54.7.3.8	less than ± 0.175 UIp	M	Yes [ ]
DS15	Deterministic jitter	54.7.3.8	less than ± 0.085 UIb	M	Yes [ ]
DS16	Random jitter	54.7.3.8	less than ± 0.09 UIp	M	Yes [ ]

54.12.4.4 Receiver specifications

Item	Feature	Subclause	Value/Comment	Status	Support
RS1	Bit Error Ratio	54.7.4.1	BER of better than 10^{-12}	M	Yes [ ]
RS2	Baud rate tolerance	54.7.4.2	3.125GBd ± 100ppm	M	Yes [ ]
RS3	A.C. Coupling	54.7.4.3		M	Yes [ ]
RS4	Input amplitude tolerance	54.7.4.4	Accepts signals compliant with 54.7.3, may be larger than 1600 mV_{ppd}	M	Yes [ ]
RS5	Input impedance	54.7.4.5	Per Eq. (54.2a) and Eq. (54.2b)	M	Yes [ ]
RS6	Jitter tolerance	54.7.4.6	Per 54.7.3.8	M	Yes [ ]
RS7	Additional sinusoidal jitter tolerance	54.7.4.6	Per Figure 54–8	M	Yes [ ]
RS8	Jitter test requirements	54.10.1	Meet BER bathtub curve, See Annex 48B	M	Yes [ ]

54.12.4.5 Cable assembly specifications

Item	Feature	Subclause	Value/Comment	Status	Support
CA1	Characteristic Impedance	54.8.1	100 Ω ± 10%	O	Yes [ ]
CA2	Insertion loss	54.8.2	Per Eq. (54.3)	M	Yes [ ]
CA3	Return loss	54.8.2	Per Eq. (54.4a), Eq. (54.4b) and Eq. (54.4c)	M	Yes [ ]
CA4	Near-End cross talk	54.8.4.1	Per Eq. (54.5)	M	Yes [ ]
CA5	MDNear-End cross talk	54.8.4.2	Per Eq. (54.6)	M	Yes [ ]
CA6	ELFar-End cross talk	54.8.5.1	Per Eq. (54.8)	M	Yes [ ]
CA7	MDELFar-End cross talk	54.8.5.2	Per Eq. (54.9)	M	Yes [ ]
CA8	Shielding	54.8.6	Class 2 or better in accordance with IEC 61196-1	M	Yes [ ]
CA9	MDI connectors	54.9.1	Used as the mechanical interface for 54.7 and 54.8	M	Yes [ ]
CA10	MDI connector	54.9.1	Used on the cable assembly	M	Yes [ ]
CA11	MDI receptacle	54.9.1	Used on the PHY	M	Yes [ ]
CA12	Connector type	54.9.1.1	SFF-8470 latch type	M	Yes [ ]
CA13	Crossover function	54.9.2	Per Figure 54–15	M	Yes [ ]

IEEE 802.3 10GBASE-T Study Group

Opening Plenary Meeting Report

Dallas Fort Worth, TX

March 10, 2003

Brad Booth, Chair
bbooth@ieee.org

Reflector and Web

- **To subscribe to any of the 10GBASE-T reflectors send an email to:**

  majordomo@ieee.org

  with the following in the <u>body of the message</u>:

  subscribe stds-802-3-10GBT <your email address>

  subscribe stds-802-3-10GBT-Modeling <your email address>

  subscribe stds-802-3-10GBT-Cabling <your email address>

- **10GBASE-T Study Group web page URL:**

  http://www.ieee802.org/3/10GBT/

Interim Meeting

- January 9-10, 2003
- Vancouver, BC, Canada
- Hosted by IEEE 802
- Fairmont Hotel Vancouver
- 80+ attendees
- 17 presentations
  - Market requirements
  - Cabling
  - Alien crosstalk
  - Auto-negotiation
  - Line coding

Goals for Interim

- **Hear presentations concerning:**
  - **Need for 10GBASE-T project in IEEE 802.3**
  - **Justification in terms of the 5 criteria (aka the 5 critters)**
  - **Goals and objectives for a project**

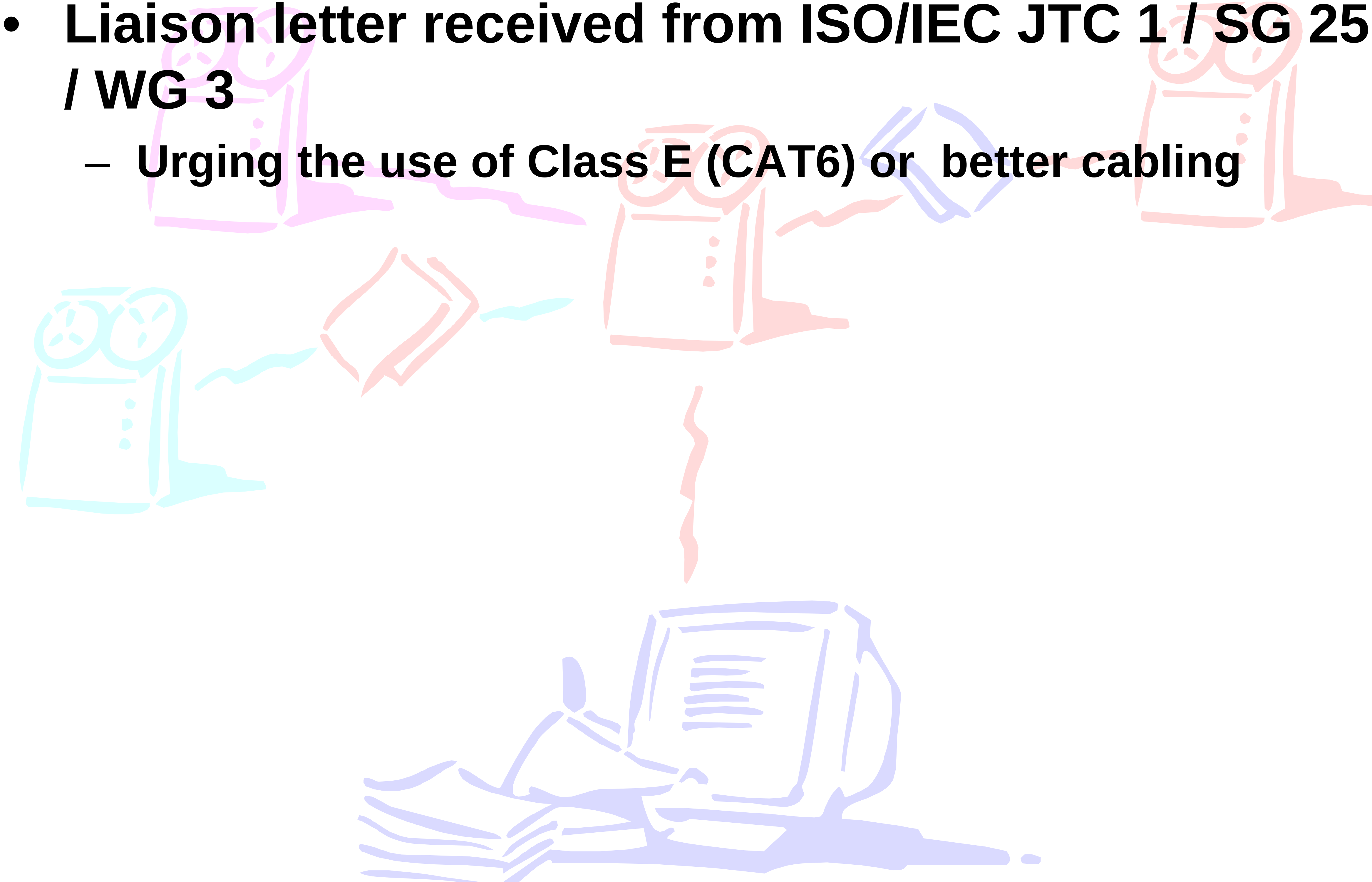
- **Start developing consensus on:**
  - **Project Approval Request (PAR)**
  - **5 Criteria responses**
  - **10GBASE-T Objectives**

Results from Interim

- Addressed informal communication from IEC-46C-W7
- SG decided to co-locate in May with CX4 and not go to South Korea
- SG decided to co-locate in September with EFM in Italy
- Two ad hocs formed:
  - Cabling: led by Chris DiMinico, MC Communications
  - PHY Modeling: led by Bill Jones, SolarFlare
- Straw poll
  - Support for auto-negotiation in 10GBASE-T was unanimous

Liaison Letter(s)

- **Liaison letter received from ISO/IEC JTC 1 / SG 25 / WG 3**
  - **Urging the use of Class E (CAT6) or better cabling**



Plans for the Week

- **Hear presentations**
  - **13 technical presentations**
- **Start developing PAR, 5 Criteria and Objectives**
  - **1 presentation on 5 Criteria**
- **Respond to liaison letter**
- **Ad hoc meetings**
  - **Cabling ad hoc, Wednesday morning**
  - **PHY Modeling ad hoc, Wednesday afternoon**

Plan for the Week (cont.)

	MON	TUE	WED	THU	FRI
08:00	SEC		Cabling Ad Hoc		
08:30		10GBT Opening		10GBT Closing & Motion Madness	
09:00					
09:30		10GBT Presentations			
10:00					
10:30	Break				
11:00	802 Plenary				
11:30				Lunch	
12:00	Lunch	Lunch	Lunch		
13:00					
13:30	802.3 Plenary	10GBT Presentations	Modeling Ad Hoc	802.3 Plenary	SEC
14:00					
14:30					
15:00					
15:30					
16:00					
16:30					
17:00					
17:30			Time Off		
18:00	Dinner	Dinner			
18:30	Tutorial #1a		Social Reception		
19:30	Tutorial #1b	Tutorial #2			
20:30	Tutorial #1c				
21:00		Tutorial #3			
21:30					

IEEE 802.3 CSMA/CD WORKING GROUP   Draft AGENDA

See our web site: http://www.ieee802.org/3

13 March 2003, DFW, TX
Start at 1:00 PM

1300, Thursday, 13 March

Administrative Matters .... Bob Grow

- Welcome and General Announcements
- Agenda, review and revise as needed
- Attendance, address list/e-mail list maintenance
- Review of Voting Membership
- Call for Patents

Liaison Actions

- Liaison Letters

Executive Committee Actions

- PARs from other groups
- Rules changes

Task Force Reports

- Rules changes .... David Law
- Interpretation requests .... David Law
  - 2-11/02 Ballot Status
  - New requests (accept, reject, send to WG Ballot)
- P802.3aj, Maintenance #7 .... David Law
  - WG Ballot Status
  - Progress this week
  - Motions
- P802.3af, Task Force (DTE Power via MDI) .... Steve Carlson
  - Progress this week
  - Motions

1445-1500   BREAK

- P802.3ah Task Force (Ethernet in the First Mile) .... Howard Frazier
  - Progress this week
  - Motions
- 10GBASE-T Study Group .... Brad Booth
  - Progress this week
  - Motions
- Ad Hoc Reports
  - Industrial Ethernet
  - Auto-Negotiation
- Link Security ECSG Report

DTE Power
via
MDI

802.3af Task Force
Closing Plenary Meeting Report
March 13, 2003
DFW Airport, TX

Steve Carlson, TF Chair
scarlson@esta.org

March Plenary Meeting

- D4.0 Sponsor Ballot
  - Ballot opened 20 November 2002
  - Ballot closed 1 January 2003
  - 80 members in the Sponsor Ballot group
  - 77% return rate – 75% required
  - 92% approval rate – 75% required

March Plenary Meeting

- Interim meeting in Vancouver, BC
  - January 6 - 10, 2003
  - Comment resolution
    - Editorial 123
    - Technical 89
    - Technical Required 56
    - Many duplicates

March Plenary Meeting

- Interim Meeting in Milpitas, CA
  - Meeting space supplied by Cisco Systems
  - Finished comment resolution to D4.0
  - Created D4.1
  - 1st Recirculation Ballot – 20 day
    - Opened 10 February 2003
    - Closed 2 March 2003
    - 77% return rate, 94% approval
    - 98 comments (31 E, 40 T, 26 TR)
    - Many duplicates, some out-of-scope

Plans for the Week

The DTE Power via MDI TF will meet on Tuesday and Wednesday from 8:30AM to 5:30PM, and Thursday 8:30AM to noon in “Galaxy”.

Goals for the week:

- Comment Resolution
  - Comment resolution to D4.1 DONE!
  - Sign-off on remaining TR’s from D4.0 DONE!
    - 100% approval rate
  - Charter Editor to create and review D4.2 DONE!
  - Prepare to start 2nd Recirculation Ballot DONE!
- 2nd recirculation 19 March – April 3, 2003

Plans for the Week

Future Meetings
April Interim – IOL, Durham, NH
April 7 - 9, 2003

July Plenary – Hyatt Regency, San Francisco, CA
July 20 - 24, 2003

http://grouper.ieee.org/groups/802/meeting/future.pdf

In the News

Article on 802.3af in March 2003

IEEE Spectrum

(Web Edition)

http://www.spectrum.ieee.org/WEBONLY/resource/mar03/won802.html

In the News

Power over Ethernet (PoE) Interoperability Group Test Period

University of New Hampshire InterOperability Laboratory
Durham, NH USA
April 7 - April 11, 2003

In the News

The Gibson "Magic"
Ethernet/802.3af Powered electric guitar

In the News

The
Ethernet/802.3af Powered soap dispenser

Task Force Info

The DTE Power via MDI Task Force maintains up-to-date information at:

http://www.ieee802.org/3/af/index.html

All archive information from earlier meetings are available. Information on subscribing to the e-mail reflector, proper usage thereof, and presentation guidelines are here. Drafts may be found in the private area.

login: 802.3af   password: ****

IEEE 802.3 requests that IEEE 802 SEC grant conditional approval per procedure 10 for submission of P802.3af to the June Standards Board meeting.

M: S. Carlson S: T. Dineen

Date: 3/13/2003

Y: 86	N: 0	A: 2

802.3 vote

Y:	N:	A:

SEC

IEEE 802.3
Interpretations Report

March 13th, 2003
DFW Airport, TX

David Law

Activities this week

- Met Wednesday afternoon
  - Reviewed open Interpretation Requests
  - Interp 2-11/02 D1.0 ballot
    - Comment resolution
    - Chartered editor to produced D1.1

Interpretations Status

- 7 Interpretations considered

  4-11/02 - Link Aggregation Control Protocol

  1-03/03 - Vertical eye closure penalty

  2-03/03 - Pause priority resolution

  3-03/03 - Twisted-pair model

  4-03/03 - 1000BASE-T Test Fixtures

  5-03/03 - 1BASE5 Isolation

  6-03/03 - 10Mb/s and 100Mb/s Repeaters

- Available on Interpretations area of web site

  http://www.ieee802.org/3/interp/index.html

IEEE Standards Companion Interpretations

"Interpretations are a unique form of commentary on the standard. They are not explanations of what the standard should have done or meant to say. Interpretations cannot change the meaning of a standard as it currently stands. Even if the request points out an error in the standard, the interpretation cannot fix that error. The interpretation can suggest that this will be brought up for consideration in a revision or supplement (or, depending on the nature of the error, an errata sheet might be issued). However, an interpretation has no authority to do any of this."

http://standards.ieee.org/guides/companion/part6.html#interpret

IEEE Standards Companion Interpretations

"Interpretations are a unique form of commentary on the standard. They are not explanations of what the standard should have done or meant to say. Interpretations cannot ch
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interpretation cannot fix that error. The interpretation can suggest that this will be brought up for consideration in a revision or supplement (or, depending on the nature of the error, an errata sheet might be issued). However, an interpretation has no authority to do any of this."

We can only interpret what the standard does say, not what it should say.

http://standards.ieee.org/guides/companion/part6.html#interpret

Interpretation Number: 4-11/02 (Link Aggregation Control Protocol)
Topic: Link Aggregation Control Protocol
Relevant Clause: 43
Classification: Unambiguous

Interpretation Request

My request for interpretation pertains to Clause 43 (Link Aggregation) of IEEE 802.3-2002, more specifically to the PICS of the aforementioned section. After having read Clause 43 and its PICS, a doubt subsists in my mind as to whether a vendor MUST implement LACP in order to claim conformance with Clause 43 of IEEE 802.3-2002. For instance, if only "manual" aggregation is implemented as suggested in 43.2.1 paragraph e on page 285 of Section 3, can the vendor still claim conformance? The PICS seem to leave no room for not checking LACP as a requirement.

I would appreciate your authoritative answer on the subject.

Interpretation for IEEE std 802.3-2002

The standard states in subclause 43.4.8 'Variables used for managing the operation of the state machines' in the definition for the 'LACP_Enabled' that 'This variable indicates that the port is operating the LACP. If the port is operating in half duplex, the value of LACP_Enabled shall be FALSE. Otherwise, the value of LACP_Enabled shall be TRUE.' As can be seen, when the port is operating in full duplex it is required to be operating LACP.

Interpretation Number: 2-03/03 (Pause priority resolution)
Topic: Pause priority resolution
Relevant Subclause: 37.2.4.2
Classification:

Interpretation Request

I have a question about the interpretation of IEEE 802.3-2002, Clause 37, paragraph 37.2.4.2, regarding Auto-negotiation and the Pause priority resolution for a 1000Base-X system.

Specifically my confusion is with Table 37-4, "Pause priority resolution". At the PHY level, are the PAUSE and ASM_DIR bits actually changed in the MDIO registers 4 (local device) and 5 (link partner) at the end of the Auto-neg process to reflect Table 37-4?

The text descriptions (e.g. "Disable PAUSE, Transmit and Receive") confuse me into thinking that perhaps this resolution is done by the MAC, not by the PHY. If the resolution was done by the PHY, I would have expected 4 columns in Table 37-4: (1) Local Device PAUSE and ASM_DIR bits *before* AN (2) Link Partner PAUSE and ASM_DIR bits *before* AN (3) Local Device PAUSE and ASM_DIR bits *after* AN (4) Link Partner PAUSE and ASM_DIR bits *after* AN.

As it is, it seems that some interpretation of the resolution description is needed.

Can you clarify this point for me? I appreciate your help. Thank you.

Interpretation Number: 2-03/03 (Pause priority resolution)
Topic: Pause priority resolution
Relevant Subclause: 37.2.4.2
Classification: Unambiguous

Interpretation for IEEE std 802.3-2002

The standard states in subclause ability 37.2.5.1.4 that Register 5 is a status of the remote device's advertised ability and in subclause 37.2.5.1.3 that Register 4 is an advertisement of the local device's advertised ability. These bits are not required to be changed to represent the result of priority resolution.

Table 37-4 'Pause priority resolution' specifies how this information should be processed to determine the optimal pause mode. We however do not specify, nor is there a need to specify, where the resolution takes place, as it does not relate to any compatibility interfaces.

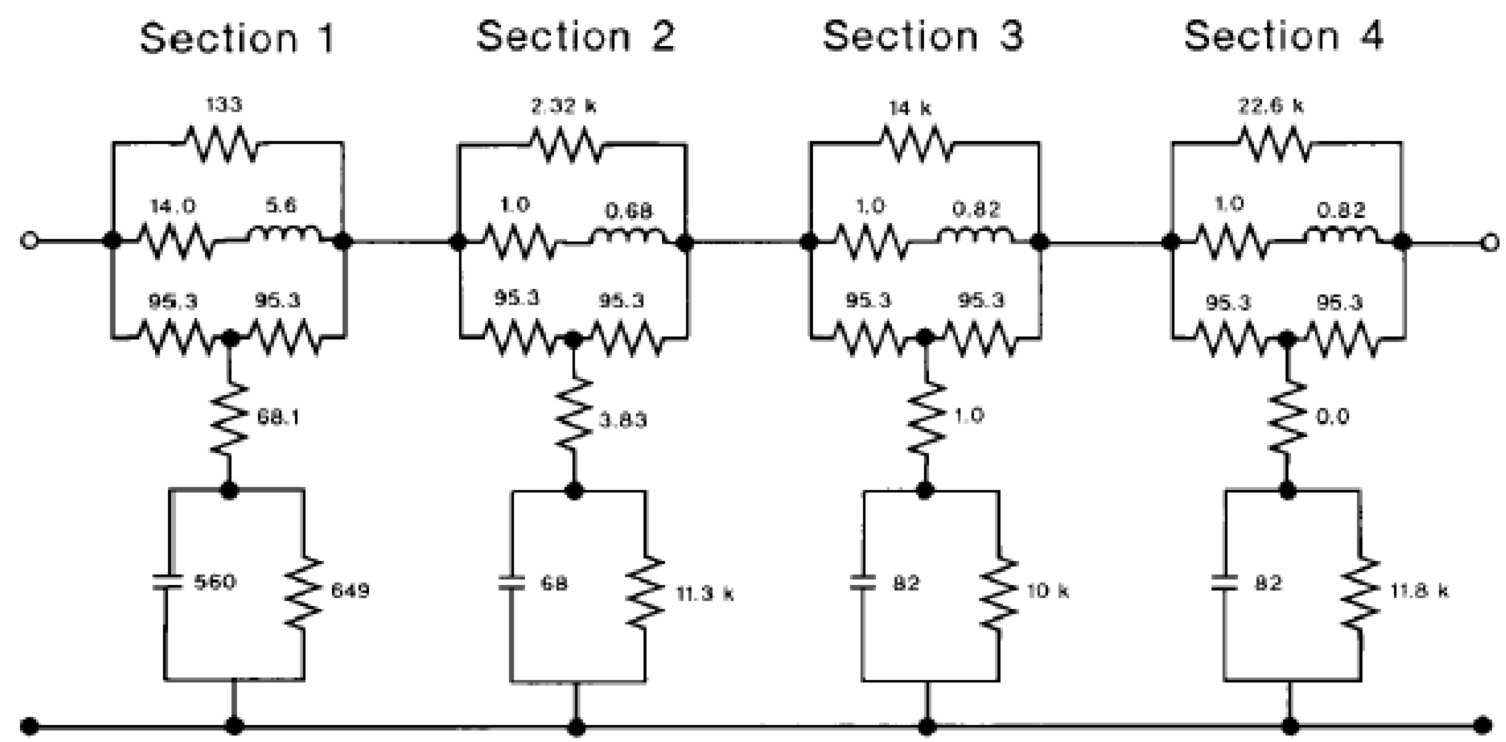
Table 37–4—Pause priority resolution

Local Device		Link Partner		Local Resolution	Link Partner Resolution
PAUSE	ASM_DIR	PAUSE	ASM_DIR		
0	0	—	—	Disable PAUSE Transmit and Receive	Disable PAUSE Transmit and Receive
0	1	0	—	Disable PAUSE Transmit and Receive	Disable PAUSE Transmit and Receive
0	1	1	0	Disable PAUSE Transmit and Receive	Disable PAUSE Transmit and Receive

Interpretation Number: 3-03/03 (Twisted-pair model)
Topic: Twisted-pair model
Relevant Subclause: 14.3.1.2
Classification:

Interpretation Request

Should I use two of the model presented in Figure 14-7 to model the twisted pair or one only (since the model is not symmetric)?



14.3.1.2 Transmitter specifications

nd parasitics
do not exceed R, C, and L tolerance values.

Resistances are in Ω
Capacitances are in pF
Inductances are in μH

Figure 14–7—Twisted-pair model

Some tests in this subclause require the use of an equivalent circuit that models the distortion introduced by a simplex link segment. This twisted-pair model shall be constructed according to Figure 14–7 with component tolerances as follows: Resistors, ±1%; capacitors, ±5%; inductors, ±10%. Component tolerance specifications shall be met from 5.0 MHz to 15 MHz. For all measurements, the TD circuit shall be connected through a balun to section 1 and the signal measured across a load connected to section 4 of the model. The balun shall not affect the peak differential output voltage specified in 14.3.1.2.1 by more than 1% when inserted between the 100 Ω resistive load and the TD circuit.

Interpretation Number: 3-03/03 (Twisted-pair model)
Topic: Twisted-pair model
Relevant Subclause: 14.3.1.2
Classification: Unambiguous

Interpretation Request

Should I use two of the model presented in Figure 14-7 to model the twisted pair or one only (since the model is not symmetric)?

Interpretation for IEEE std 802.3-2002

The standards states in the third paragraph of subclause 14.3.1.2 'Transmitter specifications' that 'For all measurements, the TD circuit shall be connected through a balun to section 1 and the signal measured across a load connected to section 4 of the model.' The balun is used to match the balanced TD circuit to the unbalanced cable model.

Interpretation Number: 4-03/03
Topic: Test Fixtures
Relevant Clause: 40.6.1.1.3
Classification:

Interpretation Request

Refer to IEEE802.3 2000 standard clause 40.6.1.1.3, is the test fixture setup shown in Figure 40.22 correct?

I have setup my test fixture (the 50ohms and 100ohms termination for each pair) and the testing equipment exactly the same shown in this figure but the result obtained is incorrect. Please advise.

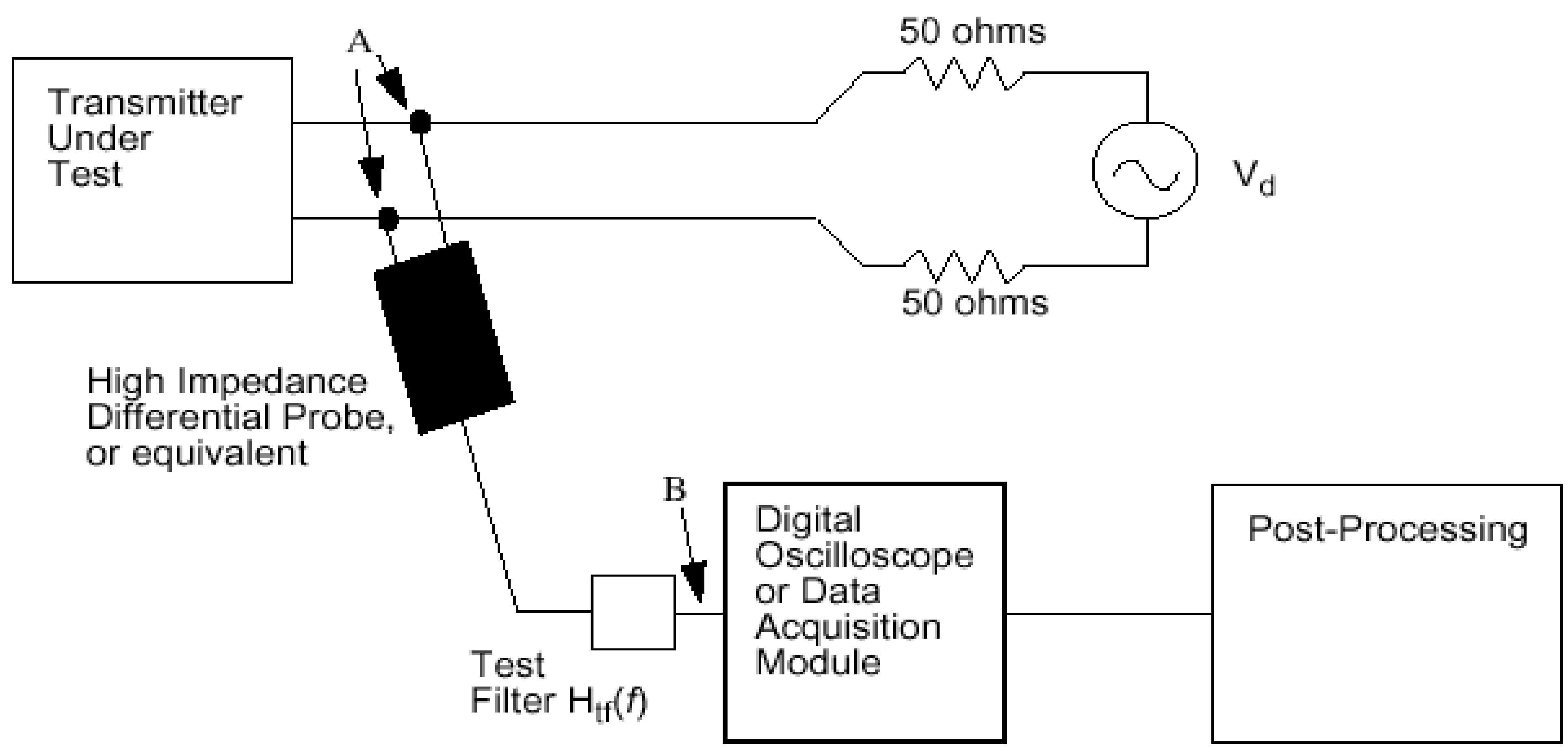


Figure 40–22—Transmitter test fixture 1 for template measurement

Interpretation Number: 4-03/03
Topic: Test Fixtures
Relevant Clause: 40.6.1.1.3
Classification: Not a request for Interpretation

Interpretation Request

Refer to IEEE802.3 2000 standard clause 40.6.1.1.3, is the test fixture setup shown in Figure 40.22 correct?

I have setup my test fixture (the 50ohms and 100ohms termination for each pair) and the testing equipment exactly the same shown in this figure but the result obtained is incorrect. Please advise.

Interpretation for IEEE std 802.3-2002

This request is being returned to you because it does not constitute a request for interpretation but rather a request for a consultation advice. Generally, an interpretation request is submitted when the wording of a specific Clause or portion of the standard is ambiguous or incomplete. The request should state the two or more possible interpretations or the lack of completeness of the text.

Interpretation Number: 5-03/03 – Item 1(1BASE5 Isolation)
Topic: 1BASE5 Isolation
Relevant Clause: 12.10.1
Classification: Unambiguous

Interpretation Request

We have a doubt about a definition in chapter 12.10.1 802.3-2002 (Safety,Isolation): there, we can read :<< Each PMA/MDI interface lead shall be isolated from frame ground>>. What is frame ground? Is the pcb GND the frame ground?

Should we test the isolation from ethernet pairs to GND?

Interpretation for IEEE std 802.3-2002

Your interpretation request referenced text in Clause 12. Clause 12 is not recommended for new installations. However, the term "frame ground" also appears in other clauses and based on this we provide the following response.

Frame ground is an equivalent term to the perhaps more common term Chassis Ground (See IEEE ~~Std.~~ 100-1996 chassis"). The connection of PCB GND to frame ground is beyond the scope of the standard.

Interpretation Number: 5-03/03 – Item 2 and 3 (1BASE5 Isolation)
Topic: 1BASE5 Isolation
Relevant Clause: 12.10.1
Classification: Not a request for Interpretation

Interpretation Request

In our PCBs and equipements there is only one GND, defined "protective bonding" for the IEC60950 safety standard. Is it compliant to 12.10.1 802.3-2002 request a discharge from the PMA/MDI interface lead to GND?

Interpretation for IEEE std 802.3-2002

These items of the request are being returned to you because they do not constitute a request for interpretation but rather a request for a consultation advice. Generally, an interpretation request is submitted when the wording of a specific Clause or portion of the standard is ambiguous or incomplete. The request should state the two or more possible interpretations or the lack of completeness of the text.

Interpretation Number: 6-03/03 (10Mb/s and 100Mb/s Repeaters)
Topic: 10Mb/s and 100Mb/s Repeaters
Relevant Clause: Clause 9 and 27
Classification:

Interpretation Request

Ethernet Repeater Questions

Those clause refers to a repeater set, my questions result from difficulties to distinguish between the repeater unit functionality to its physical part. Our design is an implementation of repeater unit with MII interface.

Clause 9 (10Mbs repeater)

General questions:

1. The clause describes the repeater as a serial bit operation, what about a nibble bits operation as in MII interface, how this affects the repeater operation? Is it correct to convert all the limit values to nibble times from bit times?

2. Is the input data to the repeater is an encoded data? Is it the repeater unit responsibility to decode the input data and only then to forward it?

Repeater unit state diagram (figure 9-2):

I understand that the state diagram handle the input data as a serial bit, is it still true to use the same state diagram with input data as nibble bit (with MII interface)?

1. State diagram notation (9.6.1):

DataIn(x) – is it right that *input_idle* refer to MII_RXDV OFF ?

And *activity* refers to MII_RADV ON? Or the MII_CRS status shall be multiply this condition as well?

2. SEND TWO ONES state – in this state it is written that “the repeater is sourcing two consecutive Manchester-encoded ones on port X” – Is it a right conclusion that the repeater has to decode the input data?

3. What if the input packet has no SFD? Who handle this? Is it the repeater unit responsibility?

Preamble regeneration (9.6.3):

My question refer to the sentence “when the repeater unit must send more than 56 bits, the maximum length preamble pattern it shall send is the number received plus 6” – what is the meaning of this, when a case like this can occurred??’

MAU Jabber Lockup Protection (9.6.5):

Is it a mandatory operation of the repeater unit? Is it the repeater unit responsibility?

Clause 27 (100Mbs repeater)

Received code violations (27.3.1.2.2):

This clause refers to the repeater set, is it the repeater unit functionality to forward or replace the code violations by *bad_code* or this is done by the PHY? If it done by the PHY how the repeater unit act in this case?

Received event handling (27.3.1.3.1):

My question refers to the sentence “Upon detection of scarier_present from one port … “, Is it true that scarier_present is the MII_CRS signal and is it right that MII_CRS in 100Mbs is active only upon reception?

Preamble regeneration (27.3.1.3.2):

Is it possible that an input frame to the repeater unit shall be without preamble pattern? If so, there is any special treatment by the repeater unit for this case?

Error Handling (27.3.1.3.5):

1. It is written that the “repeater PMA interface shall contain self-interrupt…” Is it true that this is the PHY responsibility to handle the false carrier events?

2. And what the meaning of “A repeater unit shall transmit the Jam message to all of the PMAs to which it is connected for the duration of the false carrier event or until the duration of the event exceeds the time specified by the false_carrier_timer..”

3. How the repeater unit identifies the end of the false carrier event?

4. Figure 27-9 and/or 27-10: does the repeater unit shall implement one of them?

5. LINK UNSTABLE – is it the repeater unit responsibility? Or is it done by the PHY?

Receive jabber (27.3.1.7):

Is it correct that the repeater unit does this?

Interpretation Number: 6-03/03 (10Mb/s and 100Mb/s Repeaters)
Topic: 10Mb/s and 100Mb/s Repeaters
Relevant Clause: Clause 9 and 27
Classification: Not a request for Interpretation

Interpretation for IEEE std 802.3-2002

This request is being returned to you because it does not constitute a request for interpretation but rather a request for consulting advice. Generally, an interpretation request is submitted when the wording of a specific Clause or portion of a standard is ambiguous or incomplete. The request should state the two or more possible interpretations or the lack of completeness of the text.

While you refer to Clauses 9 and 27, you have not indicated any ambiguity nor lack of completeness of the text but rather have asked a number of questions in relation to a particular implementation. The standard clearly states in '1.2.1 State diagram conventions' that 'It is the functional behavior of any unit that must match the standard, not its internal structure. The internal details of the model are useful only to the extent that they specify the external behavior clearly and precisely.' As such Clause 9 specifies the external behavior of a 10Mb/s Repeater Unit and Clause 27 specifies the external behavior of a 100Mb/s Repeater Set. A careful study of these Clauses, including their State Diagrams, will provide the answers to your questions. Please understand that it is beyond the scope of this working group to provide consulting advice on how to implement this behavior.

In respect to question in relation to a 10Mb/s repeater unit implementation that utilizes a MII, you will note that in Figure 9-1 that the repeater unit is specified only in terms of the AUI. A 10Mb/s repeater unit implementation that utilizes a MII is outside the scope of the standard.

Interpretation Number: 1-03/03 (VECP)
Topic: VECP
Relevant Clause: 52.9.10.2
Classification:

Interpretation Request

I would like the TF to interpret this statement:

The test signal includes vertical eye closure and high probability jitter components. For his test, these two components are defined by peak values that include all but 0.1% for VECP and all but 1% for jitter of their histograms.

I believe that the statement 'include all but x%' can be understood in several ways, at least three of them perfectly logical, and leading to different results. To wit:

Reading(1): exclude the x% (of the samples in the histogram) from the histogram of the eye, removing in such a way that you maximize the PkPk value

Reading(2): as in (1) but also keep the count of samples removed from the proximal* trace equal to the count of samples removed from the distal* trace

Interpretation Number: 1-03/03 (VECP)
Topic: VECP
Relevant Clause: 52.9.10.2
Classification: Ambiguous

Interpretation Request

I would like the TF to interpret this statement:

The test signal includes vertical eye closure and high probability jitter components. For his test, these two components are defined by peak values that include all but 0.1% for VECP and all but 1% for jitter of their histograms.

I believe that the statement 'include all but x%' can be understood in several ways, at least three of them perfectly logical, and leading to different results. To wit:

Reading(1): exclude the x% (of the samples in the histogram) from the histogram of the eye, removing in such a way that you maximize the PkPk value

Reading(2): as in (1) but also keep the count of samples removed from the proximal* trace equal to the count of samples removed from the distal* trace

---

Interpretation for IEEE std 802.3ae-2002

This represents an ambiguity within the standard. A change request will be generated to address this issue which will be made available at the URL:

http://www.ieee802.org/3/maint/requests/all.html

IEEE 802.3 Motion

IEEE 802.3 approves the proposed Interpretation response to the Interpretation requests 4-11/02, 1-03/03 through 6-03/03 as presented without the need for a 30 day letter ballot.

M: David Law S: Howard Frazier Tech 75%/~~Proc 50%~~

PASSED/~~FAILED~~ Date:13-Mar-2003

Y: 67 N: 0 A: 1 Time: 2:24PM

IEEE P802.3 Interpretation 2-11/02 (10 & 100Mb/s Carrier Detect) Working Group ballot

IEEE P802.3 Interpretation 2-11/02 Working Group ballot

219	Voters
111	Ballots returned
50.7%	**Return rate (> 50% required)**
78	Approval
4	Approve with comments
1	Disapprove
28	Abstain
98.8%	**Approval rate (> 75% required)**
25.2%	**Abstain rate (< 30% required)**

IEEE P802.3 Interp2-11/02 Comments

Comments	Technical Required	: 1
	Editorial	: 2
	Technical	: 7
	Total	: 10

2. DISCARD TRASH

The standard states in subclause 3.2.1 Preamble field ‘The preamble field is a 7-octet field that is used to allow the PLS circuitry to reach its steady-state synchronization with the received frame’s timing (see 4.2.5). The standard further states ….. including the end of the preamble and Start Frame Delimiter.

<u>The first 15 data bits received after CARRIER_ON are discarded in order to protect the DTE device from the effect of unreliable symbols immediately following the detection of the carrier. In normal operation these 15 bits will be part of the preamble which may be ignored and discarded.</u>

IEEE 802.3 Motion

IEEE P802.3 authorises a Working Group recirculation ballot of Interpretation 2-11/02.

IEEE 802.3 authorises the IEEE P802.3 Interpretations Ad Hoc to conduct meetings and recirculation ballots as necessary to resolve comments received during the Working Group recirculation ballot of the response to Interpretation request 2-11/02

M: David Law S: Rich Brand Tech 75%/~~Proc 50%~~

PASSED/~~FAILED~~ Date: 13-Mar-2003

Y: 68 N: 0 A: 1

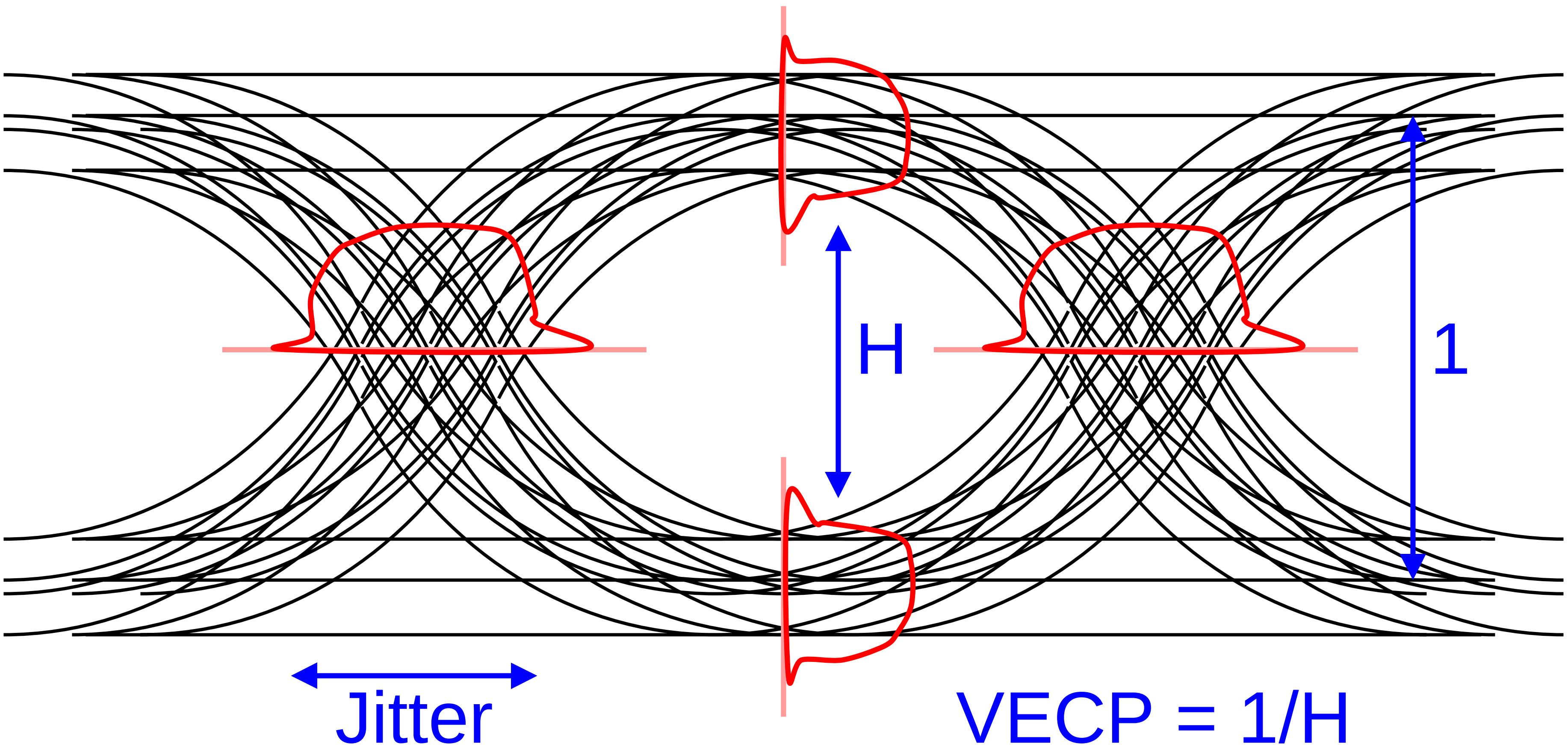
Interpretation request 1-03/03 (VECP)

From 52.9.9.2 Stressed receiver conformance test signal characteristics and calibration

The test signal includes vertical eye closure and high probability jitter components. For this test, these two components are defined by peak values that include all but 0.1% for VECP and all but 1% for jitter of their histograms. Histograms should include at least 10 000 hits, and should be about 1%-width in the direction not being measured. Residual low-probability noise and jitter should be minimized —that is, the outer slopes of the final histograms should be as steep as possible down to very low probabilities.

What does “all but x%” mean?

Histograms for stressed eye:
Jitter and Vertical Eye Closure Penalty (VECP)



Questioner suggests three options

- Reading(1): exclude the x% (of the samples in the histogram) from the histogram of the eye, removing in such a way that you maximize the PkPk value
- Reading(2): as in (1) but also keep the count of samples removed from the proximal* trace equal to the count of samples removed from the distal* trace
- Reading(3): exclude x% (of the samples in the histogram) from the histogram of the proximal* trace, symmetrically (equal nr from high and from low extreme); then do likewise for the distal* trace, then measure the opening.
- (*distal, proximal are generalized terms for the left and right in horizontal sense or bottom and top in vertical sense.)

Questioner’s opinion

The difference is important, for example if only the high level has significant spurious noise (laser oscillation, whatever) Reading(1) will lead to an possibly much better (depends on distribution) VECP result.

Reading(3) is the same as Reading(2) if the proximal and distal traces have the same nr of hits, if they don't Reading(2) is mathematically shaky. (e.g. crashes for extreme inequality, e.g. if one trace is sparse).

I don't particularly care which reading is selected; perhaps I would recommend Reading(3) as most prudent, it also is easy to implement with two histograms.

I do care, however, that we picks one ; this doesn't limit the design freedom, which would not be desirable, it only limits the specmanship freedom, which is why we have the standard.

Reviewer's opinion

If histograms are symmetrical, all three will give the same result

Reading(1): exclude the x% (of the samples in the histogram) from the histogram of the eye, removing in such a way that you maximize the PkPk value

Seems unnecessarily fiddly. May over-emphasise any tail

Reading(2): as in (1) but also keep the count of samples removed from the proximal* trace equal to the count of samples removed from the distal* trace

Should be OK unless populations of histograms differ

Reading(3): exclude x% (of the samples in the histogram) from the histogram of the proximal* trace, symmetrically (equal nr from high and from low extreme); then do likewise for the distal* trace, then measure the opening.

Simple, robust if populations of histograms differ

Interim conclusion

- Recommend reading (3) as a valid implementation
  - Not sure we need to rule out the others

Further issue

- Text maybe not very explicit about x% of what?
  - e.g. 1% on each side (1st and 99th percentile)?
  - Or total of 1% on both sides (e.g. 0.5th and 99.5th percentile)?
- It doesn’t matter much but we need to know
- Consensus of small sample of experts is that it means the latter

Situation now

- Does this level of ambiguity in test equipment count as an ambiguity in the standard?
  - If so, would raise a maintenance request
  - If not, reply to request
- Meeting on Wednesday at xxxx

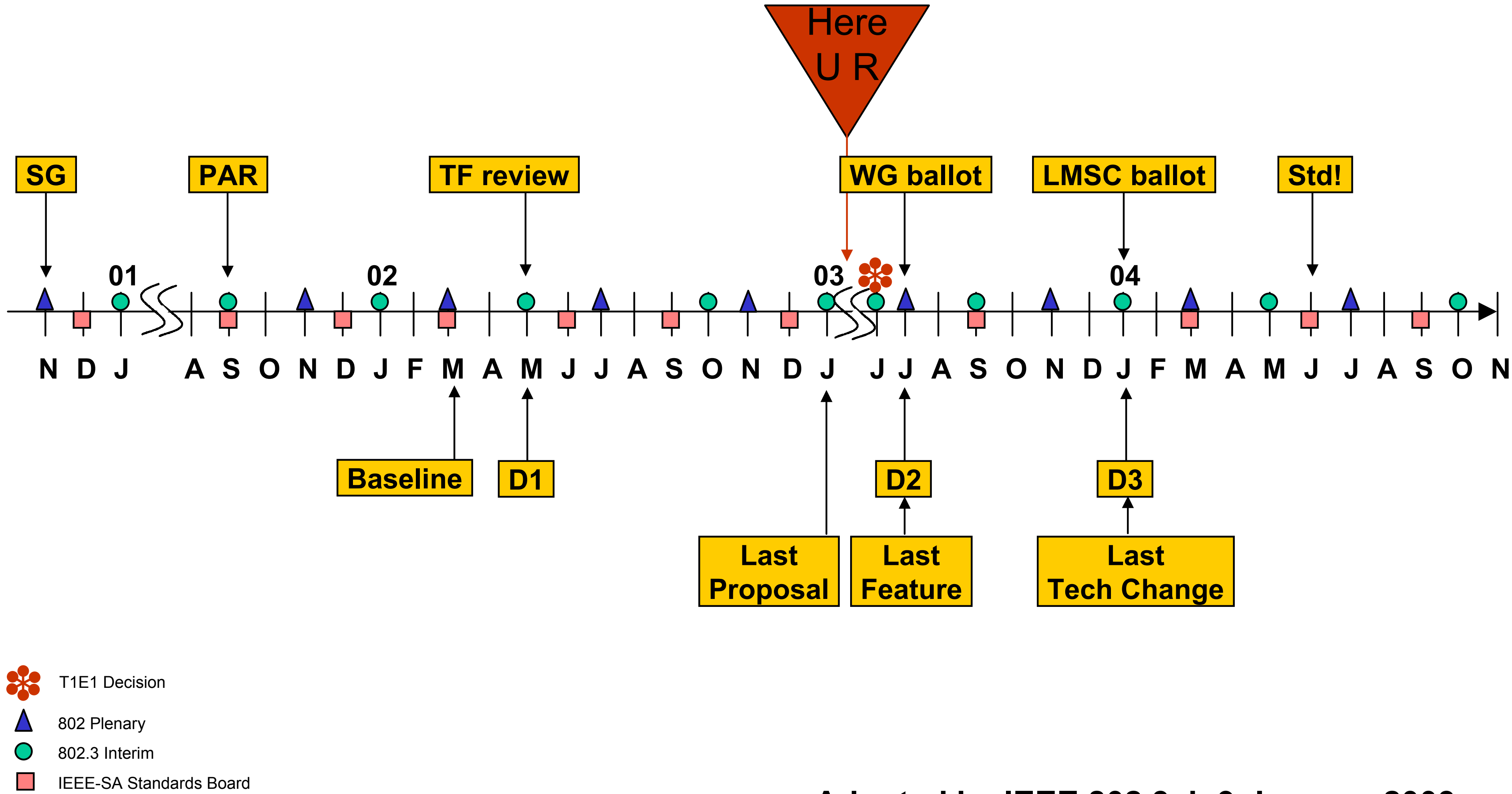
IEEE 802.3ah
Ethernet in the First Mile
Task Force

Report to 802.3
Agenda and General Information

Hyatt DFW

13-March-2003

Newly adopted timeline



Adopted by IEEE 802.3ah 9-January-2003

Review of draft D1.3

- Our editors have produced P802.3ah/D1.3, using D1.2 plus the comments that we resolved in Vancouver
- We reviewed 1059 comments on D1.3 (in two days!)
- Our editors will produce P802.3ah/D$\sqrt{2}$ after this meeting, based on the comment responses
- We will continue the Task Force review process

Big Ticket Items

- Extended Temperature Optics
  - Motion adopted which resolves associated TR comments
- Copper PHY Management
  - Made substantial progress on definition of C30 MIB objects and C45 control registers
  - Work ongoing
- 10Gig or not 10Gig
  - Will make necessary changes to C46

Extended Temperature Optics

1. ***Motion to adopt the following as means to accomplish the P802.3ah objective for extended temperature:***

- *A. Ensure that all of the Active Optical Input and Active Optical Output Interface parameters in clauses 58-60 can be met, and the corresponding links function properly, across an "extended temperature range" of operation*
- *B. Define two extended temperature ranges, and place these definitions in informative Annex 66A. One range shall apply to higher temperatures (eg. XX to YY degrees), the other to lower temperatures (eg. WW to ZZ degrees)*
- *C. Provide an optional PICS entry for each [optical] PMD indicating operation over the "extended temperature range". A separate PICS entry for each PMD indicates operation at the lower and upper range. (Implementers may choose to comply within the high range, low range, none, or both.)*
- *D. Require that compliant systems and field pluggable components be clearly labeled with the operating temperature range over which their compliance is guaranteed.*

- Moved: Scott Simon Second: Thomas Murphy
- *Technical motion, requires >= 75% in favour to pass*
- Among those present: Y:60 N:3 A:21 **MOTION PASSES**
- Among 802.3 voters: Y:41 N:3 A:14 **MOTION PASSES**

TOTAL COMMENTS 1059

- OAM
  - TR: 15 T:64 E:101
  - 0 Unresolved Total 180
- Optics
  - TR: 27 T:146 E:120
  - 7 Unresolved Total 293
- Copper
  - TR: 12 T:75 E:135
  - 2 Unresolved Total 222
- P2MP
  - TR: 22 T:166 E:123
  - 2 Unresolved Total 311
- 45
  - TR: 5 T:26 E:6
  - 0 Unresolved Total 37
- Other
  - TR: 0 T:2 E:14
  - 0 Unresolved Total 16

Motion for next draft

Charter the editorial team to produce draft SQRT(2) based on the resolution of comments in the Dallas Plenary EFM meeting.

- Moved: Wael William Diab
- Seconded: John Egan
- All: Y:84 N:1 A:1
- Motion Passes

Schedule for next draft

– Next draft to be $D\sqrt{2}$

Key Dates

– D1.3 *resolved* comment database

- **Wed 3/28/2003**

– Draft published and comment cycle open

- **Mon 3/31/2003**

– Comment deadline

- **Mon 4/28/2003**

– Proposed responses to comments

- *published prior to next meeting*

– Next Meeting

- **Mon 5/12/2003 – Thur 5/15/2003**

Liaison letters!

- ✓ Letter received from T1E1 (Copper)
- ✓ Letter received from ITU-T Q2/15 (Optics)
- ✓ Another letter received from ITU-T Q2/15 (Optics)
- ✓ Letter received from ITU-T Q4/15 (Copper)
- ✓ Letter received from ITU-T Q12/15 (OAM)
- ✓ Another letter received from ITU-T Q12/15 (OAM)
- ✓ Letter received from ITU-T Q13/4 (OAM)
- ✓ Letter received from ITU-T Q14/4 (EPON)
- ✓ Letter received from ITU-T QALL/15 (Optics)
- ✓ Letter received from TR42 (Optics)

Future meetings

- **12-15 May 2003, Seoul, South Korea - J.W. Marriot**
  hosted by Infineon & Samsung - $183/night $350/400 reg

- **24-25 June 2003, Ottawa,**
  hosted by Nortel Networks

- **20-25 July 2003, San Francisco,**
  IEEE 802 Plenary

- **15-18 September 2003, Ancona Italy,**
  hosted by Aethra

10GBASE-CX4

Study Group Report to IEEE 802.3

Daniel Dove

Chair, 10GBASE-CX4

10GBASE-CX4 Study Group…

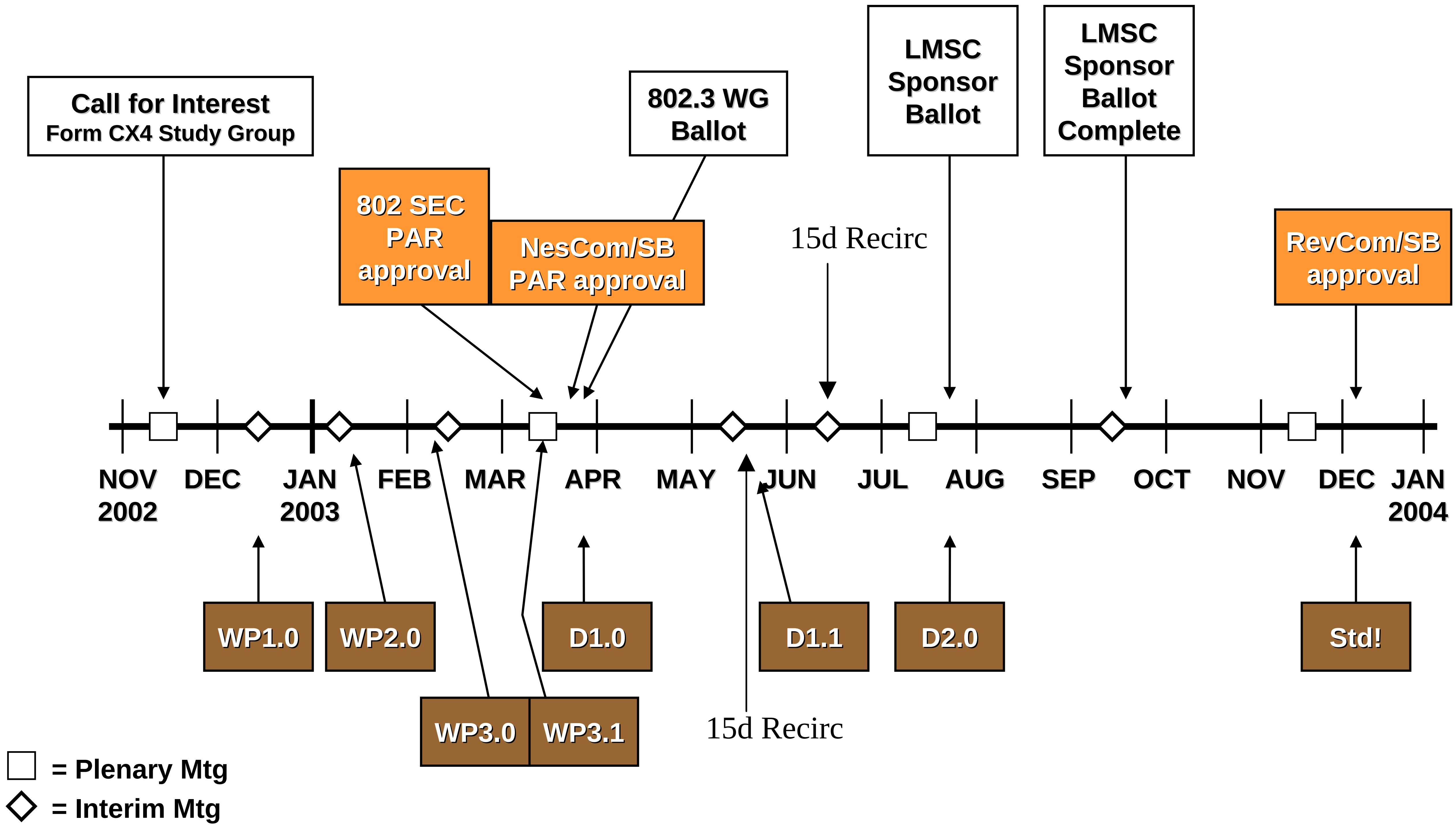
- Have now held 4 meetings as a formal Study Group
- Met this week and reviewed our PAR, 5 Criteria and Objectives.

  *** No changes to these pre-submitted documents ***
- Reviewed version 3.1 of our working paper and made some minor changes.

1. **E - Version Number → 3.2**
2. **E - Clause 44.4 corrected PIC to be consistent with Clause 54 Delay spec through 1m of cable. It was previously 15m. Editor missed implementing the change as directed in Raleigh.**
3. **E - Table 45-8, Sections 45.5.5.3 and 45.2.1.9.5 were inadvertently renumbered when generating version 3.1 as we changed from full clause to "changes only" format.**
4. **T - Corrected 54.6.9 to correct a "carryover" error from XAUI that would have caused the PMD to be put into loop back when the PCS/PMA were instructed to enter loop back.**
5. **T - Modified Figure 54-3 to indicate load "impedance" rather than resistance, re-named Section 54.7.3.2 from "Test Load" to "Test Fixture Impedance" and modified text to address point that it is impedance being specified versus resistance.**
6. **E - Corrected the spelling of "vertical" in Section 54.7.3.6**

- Passed three motions related to our PAR and Working Paper

10GBASE-CX4 Estimated Timeline



Study Group Motion: 1

Accept the changes to our Working Paper version 3.1and request editor to create working paper 3.2.

Moved: Steve Dreyer

Second: Schelto Van Doorn

Y:18

N: 0

A: 1

Study Group Motion: 2

Request 802.3 accept 10GBASE-CX4 PAR, Objectives and 5 Criteria and forward to the 802 exec.

Moved: Howard Baumer

Second: Peter Bradshaw

Y: 18

N: 0

A: 0

Study Group Motion: 3

Request 802.3 accept the distribution of Working Paper version 3.1 as fulfilling 802.3 rule 2.8.2. Upon PAR approval:

a) Convert working paper 3.2 (incorporating changes to 3.1 agreed to this week) to 802.3ak/D1.0

b) Release draft 1.0 for working group ballot and necessary recirculation ballots

c) Authorize 802.3ak task force interim meetings in order to resolve working group ballot and/or re-circulation comments

Moved: Jeff Cain

Second: Ze’ev Roth

Y:20

N: 0

A:0

Motion:

Accept 10GBASE-CX4 PAR, Objectives and 5 Criteria and forward PAR and 5 Criteria to the 802 exec.

Moved: Dan Dove

Second: Steve Carlson

Motion:

Without setting a precedent, accept the distribution of Working Paper version 3.1 as fulfilling 802.3 rule 2.8.2. Upon PAR approval by the IEEE- SA Standards Board:

a) Convert working paper 3.2 (incorporating changes to 3.1 agreed to this week) to 802.3ak/D4.0

b) Release draft 4.0 for working group ballot and necessary recirculation ballots

c) Authorize 802.3ak task force interim meetings in order to resolve working group ballot and/or re-circulation comments

Moved: Dan Dove

Second: Jeff Cain

Y: 40

N: 3

A: 10

Interim Meetings

May 20,21
Portsmouth, NH
Host: MC Communications

June 24,25
Ottawa, Canada
Host: Nortel
*** Tentative upon WG Ballot Authorization ***

Sept 15-18
Anacona, Italy
Host: Aethra

THANK YOU!!!

IEEE 802.3 10GBASE-T Study Group

Closing Plenary Meeting Report

Dallas Fort Worth, TX

March 13, 2003

Brad Booth, Chair
bbooth@ieee.org

Thanks

- **George Eisler for developing a first draft of the 5 Critters**
- **Chris DiMinico et al. for their contribution to the Cabling Ad Hoc**
- **William Jones et al. for their contribution to the Modeling Ad Hoc**
- **Thanks to all 10GBASE-T presenters and attendees!**

Schedule for the Week

	MON	TUE	WED	THU	FRI
08:00	SEC		Cabling Ad Hoc		
08:30		10GBT Opening		10GBT Closing & Motion Madness	
09:00					
09:30		10GBT Presentations			
10:00					
10:30	Break				
11:00	802 Plenary				
11:30				Lunch	
12:00	Lunch	Lunch	Lunch		
13:00					
13:30	802.3 Plenary	10GBT Presentations	Modeling Ad Hoc	802.3 Plenary	SEC
14:00					
14:30					
15:00					
15:30					
16:00					
16:30					
17:00					
17:30			Time Off		
18:00	Dinner	Dinner			
18:30	Tutorial #1a		Social Reception		
19:30	Tutorial #1b	Tutorial #2			
20:30	Tutorial #1c				
21:00		Tutorial #3			
21:30					

Plans for the Week

- **Hear presentations**
  - **13 technical presentations**
  - **2 new technical presentations added**
- **Start developing PAR, 5 Criteria and Objectives**
  - **1 presentation on 5 Criteria**
  - **Adopted a baseline for the 5 Criteria**
- **Respond to liaison letter**
  - **Tabled ISO/IEC 11801 response to July**
  - **Generated liaison letter for TR42**
- **Ad hoc meetings**
  - **Cabling ad hoc, Wednesday morning**
  - **PHY Modeling ad hoc, Wednesday afternoon**

Next Meetings

- **May 21-22, 2003:**
  - **Sheraton Harborside Hotel, Portsmouth, NH**
  - **Hosted by MC Communications**
  - **10GBT: 20 (+5-10)**
  - **802.3:**
- **July 20-25, 2003:**
  - **San Francisco, CA**
  - **Hyatt Regency**

Cabling Ad Hoc Summary

- **Response to ISO/IEC 11801**
  - **Motion to table until July meeting**
    - **B. Booth/T. Cobb, passed by acclamation**
  - **11801 does not meet until September 2003**
  - **SG wants to collect more data prior to responding**
- **Liaison letter to TIA TR42**
  - **Motion to task Chris DiMinico to draft a liaison letter to TR42**
    - **C. DiMinico/B. Booth, passed by acclamation**
  - **TR42 meets in June**
  - **Goal is to make TR42 aware of our effort and solicit their support**

Modeling Ad Hoc Summary

- **Near term objectives (May)**
  - **Capacity measurements**
    - **10 dBm launch power**
    - **Option of Watefilling w/ FCC Class A or Brickwall**
    - **Conference call**
  - **Motion to adopt Test Cases**
    - **C. DiMinico/G. Zimmerman 23:0:4**
- **Long term objectives**
  - **Optimal DFE SNR**
    - **Conference call**
  - **Motion to adopt 1e-12 BER**
    - **C. DiMinico/B. Booth, passed by acclamation**

10GBT SG Motion #1

- **Move that:**
  The 10GBASE-T Study Group requests that 802.3 take the appropriate steps to secure the extension of the Study Group's existence to encompass the 802 Plenary meeting of November 2003.
- **Moved: G. Eisler**
- **Seconded: A. Flatman**
- **Technical (>75%)**
- **All: Y: 33 N: 0 A: 0 PASSES**
- **802.3: Y: 10 N: 0 A: 0 PASSES**

10GBT SG Motion #2

- **Move that:**
  The 10GBASE-T Study Group adopt as a baseline for the 5 Criteria presentation eisler_2_0303.pdf.
- **Moved: G. Eisler**
- **Seconded: G. Zimmerman**
- **Technical (>75%)**
- **All: Y: 41 N: 0 A: 0**
- **802.3: Y: 10 N: 0 A: 0**

10GBT SG Motion #3

- **Move that:**
  The 10GBASE-T Study Group Chair requests that the 802.3 Chair forward the following liaison request (properly formatted) to TIA TR42.

  The 802.3 working group of the IEEE LAN-MAN Standards Committee has initiated a study group to investigate 10 Gigabit Ethernet operation on 4-pair 100 ohm Class D or better copper cabling as specified in ISO/IEC 11801 2nd edition. The investigation includes characterization of the Class D or better channel performance extending beyond the frequencies currently specified in ISO/IEC 11801 2nd Edition. The initial range of interest for frequency characterization is: $1 \text{ MHz} \le f \le 625 \text{ MHz}$. In addition, the study group is investigating alien crosstalk impairments. The study group would appreciate the assistance of TR42 in this effort. The information provided will be utilized in simulation modeling to validate the technical feasibility.

- **Moved: P. Thaler**
- **Seconded: J. Babanezhad**
- **Technical (>75%)**
- **All: Y: 36 N: 0 A: 2**
- **802.3: Y: 9 N: 0 A: 1**

802.3 Motion #1

- **Based upon 10GBT SG Motion #1;**
  Move that 802.3:
  - **Authorize the 10GBASE-T Study Group to pre-submit their draft PAR and 5 Criteria to the 802 SEC for consideration at the July Meeting.**
  - **Renew the charter of the 10GBASE-T Study Group for another meeting cycle.**
- **Moved: B. Booth**
- **Seconded: D. Law**
- **Technical (>75%)**
- **802.3: Y: 49 N: 0 A: 3 PASSES**

802.3 Motion #2

- Move that:
  The 802.3 Chair forward the following liaison request (properly formatted) to TIA TR42.

  The 802.3 working group of the IEEE LAN-MAN Standards Committee has initiated a study group to investigate 10 Gigabit Ethernet operation on 4-pair 100 ohm Class D or better copper cabling as specified in ISO/IEC 11801 2nd edition. The investigation includes characterization of the Class D or better channel performance extending beyond the frequencies currently specified in ISO/IEC 11801 2nd Edition. The initial range of interest for frequency characterization is: 1 MHz $\leq$ f $\leq$ 625 MHz. In addition, the study group is investigating alien crosstalk impairments. The study group would appreciate the assistance of TR42 in this effort. The information provided will be utilized in simulation modeling to validate the technical feasibility.

- Moved: B. Booth on behalf of the 10GBASE-T Study Group
- Seconded: N/A
- Technical (>75%)
- 802.3: Y: N: A:

802.3 Motion #2

- **Move that:**
  The 802.3 Chair forward the following liaison request (properly formatted) to TIA TR42.

  The 802.3 working group of the IEEE LAN-MAN Standards Committee has initiated a study group to investigate 10 Gigabit Ethernet operation on 4-pair 100 ohm Class D or better horizontal copper cabling as specified in ISO/IEC 11801 2nd edition. The investigation includes characterization of the Class D or better channel performance extending beyond the frequencies currently specified in ISO/IEC 11801 2nd Edition. The initial frequency range of interest for frequency characterization is: 1 MHz $\le$ f $\le$ 625 MHz. In addition, the study group is investigating alien crosstalk impairments. The study group would appreciate the assistance of TR42 in this effort. The information provided will be utilized in simulation modeling to validate the technical feasibility.

- **Moved: B. Booth on behalf of the 10GBASE-T Study Group**
- **Seconded: N/A**
- **Technical (>75%)**
- **802.3: Y: N: A:**
- **Motion on amendment as above: PASSES by acclamation**

802.3 Motion #2

- **Move that:**
  The 802.3 Chair forward the following liaison request (properly formatted) to TIA TR42.
  The 802.3 working group of the IEEE LAN-MAN Standards Committee has initiated a study group to investigate 10 Gigabit Ethernet operation on 4-pair 100 ohm horizontal copper cabling as specified in ISO/IEC 11801 2nd edition. The initial frequency range of interest is: 1 MHz $\leq$ f $\leq$ 625 MHz. In addition, the study group is investigating alien crosstalk impairments. The study group would appreciate the assistance of TR42 in this effort. The information provided will be utilized in simulation modeling to validate the technical feasibility.

- **Moved: B. Booth on behalf of the 10GBASE-T Study Group**
- **Seconded: N/A**
- **Technical (>75%)**
- **802.3: Y: 40 N: 0 A: 2**

Thank You!

Motion: Liaison to IEEE 802.1

To: Tony Jeffree, Chair IEEE 802.1

Whereas the IEEE P802.1ab (Link Discovery) project has aspects that may overlap with aspects of IEEE P802.3ah, Clause 57 (EFM's OAM), we request 802.1 to review Draft 1.4 of Clause 57 and provide feedback.

Mover: Jonathan Thatcher Seconder: David Law

Motion Passes / Fails

For Against Abstain

Motion: Liaison to IEEE 802.1

To: Tony Jeffree, Chair IEEE 802.1

Whereas the IEEE P802.1ab (Link Discovery) project has aspects that may overlap with aspects of IEEE P802.3ah, Clause 57 (EFM's OAM), we request the 802.1 Working Group to review Drafts 1.4 of Clause 57 and provide feedback prior to EFM's June Interim Meeting or sooner.

Mover: Jonathan Thatcher Seconder: David Law

Motion Passes by acclamation

IEEE P802
Link Security
Executive Committee Study Group

March Meeting Summary

Dallas, March 10-12, 2003

General Information

- **SG home page**

  http://www.ieee802.org/linksec

- **Reflector: *stds-802-linksec***

  (instructions also in home page)

  To subscribe send email to *majordomo@ieee.org*

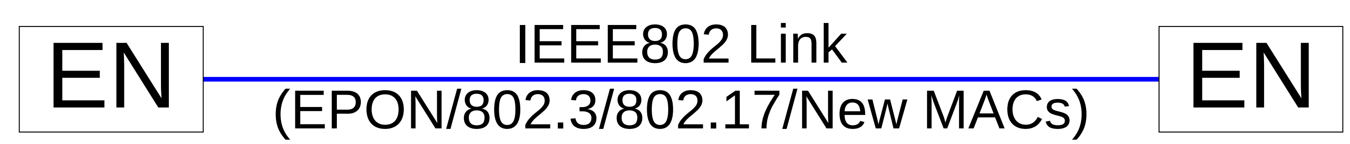
  Include in the body of the message the following

  Subscribe stds-802-linksec <your email address>

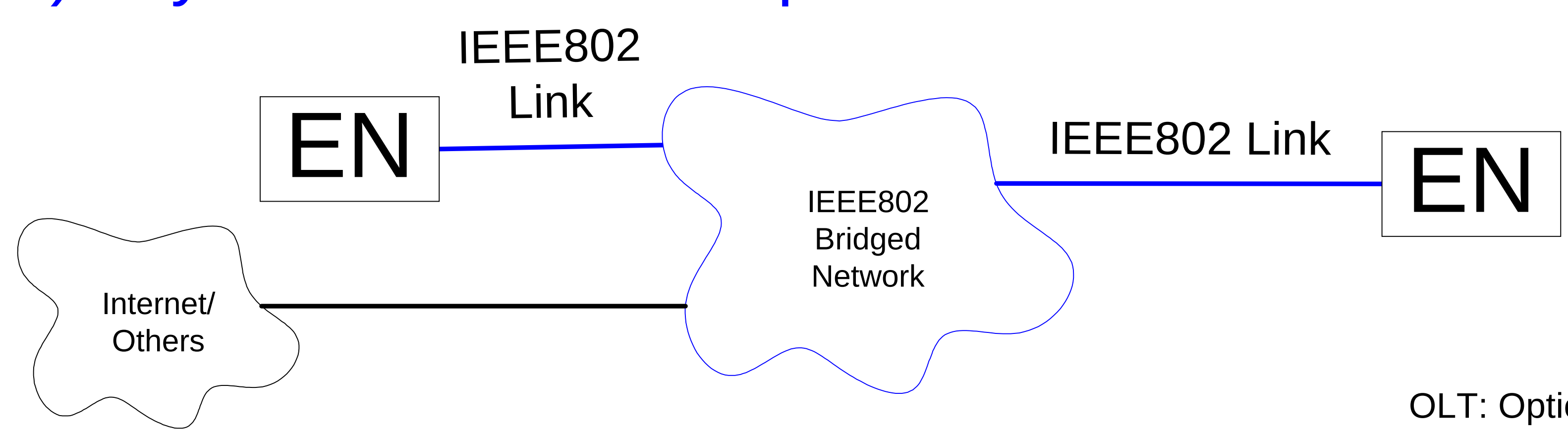
Business Scenarios

B1) EPON link scenario - Required (imminent need)

B2) Extension to other IEEE802 links/MACs - Required



B3) Layer 2 Network - Required



OLT: Optical Line Terminal (CO side)
ONU: Optical Network Unit (Client side)
EN: End Network Point
In blue: Scope of secure communication

Objectives

Select and/or specify:

- **A unified security architecture (high priority)**
- **A bridge-transparent secure data exchange mechanism (high priority)**
- **An authentication protocol (high priority)**
- **A key management protocol (high priority)**
- **A link security mechanism for 802.3 (including ptp, shared media, and PON) networks if additional MAC-specific functionality is needed (high priority)**
- **A discovery protocol (low priority)**

Business Level Requirements

1. Prevent theft of service

2. Separate customers from each other

3. Keep billing records

4. Maintain consistency between media (unified security across media, ability to securely bridge across media, ability to handoff security associations)

5. Specify a complete solution (by either selecting existing standards or defining new specifications)

Study Group Charter

- **Evaluate link security architecture issues with the objective of identifying the broader scope that can be common to all MAC solutions**
- **Develop PAR(s) and 5 Criteria for a new standard for a security architecture and link security mechanisms that can be applied to IEEE 802 networks, with early emphasis on 802.3 networks**
- **Make a recommendation on the placement of the approved PAR(s) within a new or existing IEEE 802 working groups**

SG Vote: Favor 32 Against 0 Abstain 4

Next Interim Meeting

- **Ottawa, Canada, June 2-6, 2003**
- **Co-located with 802.1, 802.3 10GBASE-CX4 SG, 802.3 10GBASE-T SG**

BUILDING GLOBAL COMMUNICATIONS

TR-42 – Engineering Committee on User Premises Telecommunications Infrastructure

Date: February 8, 2002

To: **Bob Grow, Chair IEEE 802.3 (bob.grow@intel.com)**
cc: Masood Shariff; Chair TR-42.7 (shariff07724@yahoo.com)
Peter Sharp; ChairTR-42.9 (peter.sharp@giffels.com)
Bob Lounsbury; Vice-chair TR 42.9 (Relounsbury@ra.rockwell.com)
Paul Kish, Vice-chair TR-42 (paul.kish@nordx.com)
Stephanie Montgomery, TIA (smontgom@tia.eia.org)
Chris Diminico, IEEE Liaison (cdiminico@ieee.org)

From: Bob Jensen, Chair TIA TR-42

Subject: Balance And Common Mode Rejection Requirements Of The Network Interface In An Industrial Situation

There is a growing deployment of Ethernet networks in industrial environments. Current investigations in the TIA TR 42.9 subcommittee on Industrial Telecommunications Cabling Infrastructure have identified a need for improved balance requirements for network interfaces and telecommunications cabling used in industrial environments. We have found that there is a correlation between the balance of a link segment including the “impedance balance at the MDI network interface” and the bit error rate performance of industrial Ethernet networks.

As we advance the development of industrial UTP and ScTP cable specifications we need to rely on a greater noise immunity performance of the network interface. Specifically, to set the balance requirements of the cables and connectors, we must have a clear understanding of the balance of the networking equipment at the MDI interface. For example, this is currently specified in Std IEEE 802.3 2000 edition, clause 40.8.3.2 as: 34 – 19.2*log(f/50). We are requesting IEEE 802.3 to determine if this requirement can be improved to provide better noise immunity performance for the industrial Ethernet networks.

Likewise, the common-mode noise rejection requirement in Clause 40.6.1.3.3 specifies a longitudinal voltage of 1.0 V_{rms} and a related common mode rejection requirement in a reference document for TP-PMD (ANSI X3.263-1995) specifies a longitudinal voltage of 1.0 V peak-to-peak. Can this

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longitudinal voltage threshold be increased to provide a higher immunity of the receiver to common mode noise from the cabling system?

The TR42 committee would appreciate if IEEE 802.3 could review and comment on the capability to provide improved noise immunity performance of Ethernet networks used in industrial environments.

Bob Jensen
Chair TR 42

TR-42 – Engineering Committee on User Premises Telecommunications Infrastructure

Date: February 8, 2002

To: **Bob Grow, Chair IEEE 802.3 (bob.grow@intel.com)**
cc: Masood Shariff; Chair TR-42.7 (shariff07724@yahoo.com)
Paul Kish, Vice-chair TR-42 (paul.kish@nordx.com)
Stephanie Montgomery, TIA (smontgom@tia.eia.org)
Chris Diminico, IEEE Liaison (cdiminico@ieee.org)

From: Bob Jensen, Chair TIA TR-42

Subject: ESD Phenomena and Mitigation Procedures

An ESD white paper is available to IEEE 802.3 at www.category6.org. The information contained within the document will serve as the basis for part of a future TIA Telecommunications Systems Bulletin (TSB). In the interim, TR 42 believes that the information included in this white paper would be helpful to IEEE committee members who are involved in studying ESD phenomena.

Bob Jensen
Chair TR 42

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From: Paul Nikolich [paul.nikolich@att.net]
Sent: Friday, February 28, 2003 10:35 AM
To: Mike Takefman; bob.grow@ieee.org
Subject: Fw: Liaison Statement from ITU-T SG15 to T1 (T1X1), IEC (TC86),IETF,IEEE 802, ATM Forum, OIF, MEF, TIA - corrigendum

resend
----- Original Message -----
From: <Paolo.Rosa@itu.int>
To: <j.carlo@ieee.org>; <p.nikolich@ieee.org>; <mlerer@fpga.com>; <dspears@ciena.com>; <berthold@ciena.com>; <steve.joiner@ignisoptics.com>; <'pbottorf@nortelnetworks.com'>; <bklessig@cisco.com>; <nan@atricia.com>; <u.rossi@sirti.it>; <Pietro.DiVita@tilab.com>; <rhapeman@telcordia.com>; <KapronFP@corning.com>; <cherin@lucent.com>; <mhumph03@harris.com>; <sob@harvard.edu>; <mankin@psg.com>; <sob@harvard.edu>
Cc: <wery@nortelnetworks.com>; <OkamuraH@corning.com>; <mark.jones@mail.sprint.com>; <jmcdonou@cisco.com>; <gparsons@nortelnetworks.com>; <statements@ietf.org>
Sent: Monday, February 24, 2003 12:12 PM
Subject: Liaison Statement from ITU-T SG15 to T1 (T1X1), IEC (TC86),IETF,IEEE 802, ATM Forum, OIF, MEF, TIA - corrigendum

> Dear Sirs,
>
> please, note that in page 15 of R 40 attached to the ITU-T SG 15 Liaison
> Statement LS-49, the Rapporteur of ITU-T Q.16/15 Characteristics of
optical
> systems for terrestrial transport networks (WP4) Mr. John Eaves has been
> replaced by Mr. J. Shrimpton, as follows:
>
> Rapporteur: Mr. Jerry Shrimpton
> Ciena Corporation
> P. O. Box 2018
> Evergreen, CO 80437
> USA
> Tel: +1 303 674 0981
> Fax: +1 303 674 0982
> Email: shrimpton@att.net
>
>
> Thank you and best regards
>
> P. ROSA
> TSB Counsellor
> To SGs 6 and 15
>
>
>

ISO/IEC JTC 1/SC 25/WG 3 **N 638**

Date: 2003-2-19

Replaces ISO/IEC JTC 1/SC 25/WG 3 N n/a

Customer Premises Cabling
Secretariat: Germany (DIN)

DOC TYPE:	**Liaison Report**
TITLE:	**Liaison report to IEEE 802.3 on on 10G Developments**
SOURCE:	**WG 3** (Wellington 65A)
PROJECT:	**25.03.02.xx: Generic cabling for customer premises**
STATUS:	**This liaison report was approved by WG 3 at its meeting in Wellington, New Zealand, 2003 02 10/14.**
ACTION ID:	**FYI**
DUE DATE:	**2003-09/15/18**
REQUESTED: ACTION	**This liaison report is sent to IEEE 802.3 with the kind request for consideration.** **The next meeting of WG 3 is planned in Switzerland 2003-09-15/18.**
MEDIUM:	**Open**
No of Pages:	**25 (including cover)**

DISTRIBUTION:

Members of JTC 1/SC 25/WG 3, see N 658
JTC 1 Secretariat, Mrs Rajchel
JTC 1/SC 25 Chairman, Dr. Zeidler
CENELEC TC 215 CPC Mr Gilmore
IEEE 802.3, Mr Grow
IEC Central Office, Mr Barta
DKE, Hr Wegmann
JTC 1/SC 25 Secretariat, Dr. von Pattay
IEEE 802, Mr. Nikolich

Secretary - ISO/IEC JTC 1 / SC 25/WG 3 - Dr.-Ing. Walter P. von Pattay
c/o Siemens AG, CT SR IC, D- 81730 München, Germany
Tel.: +49/89/923 967 57,
EM1: Walter.Pattay@Siemens.com EM2: Walter@Pattay.com
Ftp address SC 25: "ftp.iec.ch", login: "sc25mem", password: see SC 25 N 791
Home page SC 25: "http:/www.iec.ch/sc25"

Liaison report to IEEE 802.3 on 10G Developments

Date: 2003-February-14
To: IEEE 802.3
From: ISO/IEC JTC 1/SC 25/WG 3
Subject: Liaison Report from ISO/IEC JTC 1/SC 25/WG 3 to IEEE 802.3 on 10G Developments

ISO/IEC JTC 1/SC 25/WG 3 has been following with interest your progress towards the definition of a PAR for 10GBASE-T. We reviewed this at our Wellington, New Zealand meeting of February 10-14, and would like to offer the following comments.

1. We note that initial discussions regarding the PAR for 10GBASE-T centre around the use of channels "Category 5 / Class D or better"
2. We would like to advise you that the "Category 5 / Class D" specifications in ISO/IEC 11801 have recently been updated to be equivalent to TIA/EIA 568B.1 Category 5e, and the installed base also commonly referred to as "Category 5" will have significant variations, as these are not verified for the additional requirements specified in the 2nd Edition of ISO/IEC 11801.
3. We would also advise you that the lowest common denominator found in the installed base is equivalent to the first edition of ISO/IEC 11801 from 1995. Please refer to this ISO/IEC document for a definition of the installed base of Category 5 / Class D cabling.
4. This Working Group has re-engineered and specified the Category 5 / Class D Channel to accommodate the needs of IEEE 802.3, which we agreed to do in the lack of higher specified classes of transmission. We presently have a number of active projects under way and would find it difficult to justify any further work on "Category 5 / Class D" specifications, due to its anticipated obsolescence.
5. The strategic decision to develop higher performance cabling, Classes E and F, to accommodate future applications was based on the increasing channel performance trend required by Ethernet as it has evolved.
6. The recently published ISO/IEC 11801 2nd Edition (2002), specifies channel and link Classes E and F based on higher performance components to support the development and implementation of future applications
7. We would like to note that the installed base of Category 6 / Class E and Category 7 / Class F channels, currently specified up to 250 MHz and 600 MHz respectively, has been growing rapidly since 1997, and Category 6 / Class E channels are expected to become a significant share of the installed base by the time your standard is expected to be completed.

In light of the above observations we strongly urge you to focus on the support of 10GBASE-T over channels "Category 6 / Class E or better", in order that we may co-operate with you in the most expedient manner.

Respectfully submitted

ISO/IEC JTC 1/SC 25/WG 3

Annex 1 Excerpt from ISO/IEC 11801: 1995,

NOTE 1 - This edition was approved for publication 1994 and published 1995-07-15.

NOTE 2 – The effect of equipment and work area cords need to be added to the link values specified in clause 7 of edition 1 of ISO/IEC 11801 to arrive at channels values. Edition 2:2002 specifies the channels including such cords.

7 Link specifications

This clause defines the performance requirements of installed generic cabling. The performance of the cabling is specified for individual links and for two different media types (balanced cables and optical fibre). A tutorial on the material in this clause is provided in annex F.

The design rules of clause 6 can be used to create generic cabling links containing components specified in clauses 8 and 9. The link specifications in this clause allow for the transmission of defined classes of applications over distances other than those of clause 6, and/or using media and components with different transmission performance than those of clauses 8 and 9.

The performance requirements described in this clause may be used as verification tests for any implementation of this International Standard, using the test methods defined, or referred to, by this clause. Additionally, they can be used for qualification of existing cabling, diagnosis at the cabling link level, and as the basis for an alternative implementation.

Care should be exercised in the interpretation of any results obtained from alternative test methods or practices. When needed, correlation factors should be identified and applied.

The performance of a cabling link is specified at and between interfaces to the link. The cabling comprises only passive sections of cable, connecting hardware, and patch cords. Active and passive application specific hardware is not addressed by this International Standard. Figure 11 shows an example of terminal equipment in the work area connected to a host using two links; an optical fibre link and a balanced cable link. The two links are connected together using an optical fibre to balanced cable converter. There are four link interfaces; one at each end of the copper link, and one at each end of the optical fibre link.

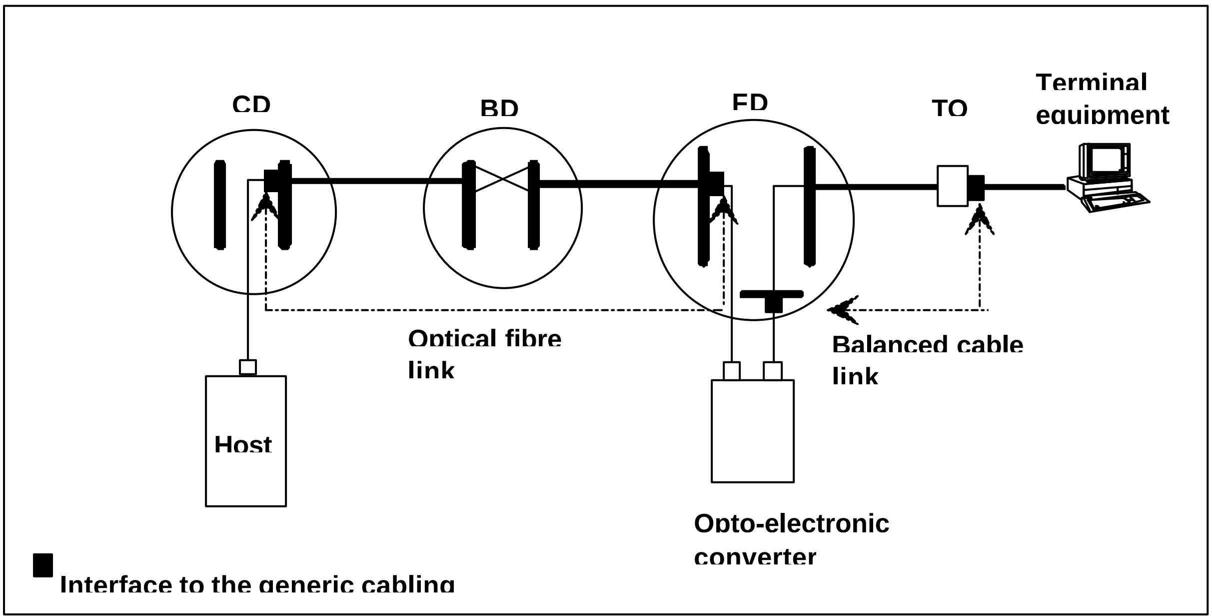

Figure 11 - Example of a system showing the location of cabling interfaces and extent of associated links

Interfaces to the cabling are at each end of a link. Interfaces to the cabling are specified at the TO and at any point where application specific equipment is connected to the cabling; the work area and equipment cabling are not included in the link.

The link performance requirements specified in this clause shall be met at each interface specified for each medium. It is not necessary to measure every parameter specified in this clause as conformance may also be proved by suitable design.

Link performance specifications shall be met for all temperatures at which the cabling is intended to operate. Performance testing may be carried out at ambient temperature, but there shall be adequate margins to account for temperature dependence of cabling components as per manufacturer's specifications. The effects of ageing should also be taken into account. In particular, consideration should be given to measuring performance at worst case temperatures, or calculating worst case performance based on measurements made at other temperatures.

7.1 Classification of applications and links

7.1.1 Application classification

Five application classes for cabling have been identified for the purposes of this International Standard. This ensures that the limiting requirements of one system do not unduly restrict other systems.

The application classes are:

Class A — applications include speech band and low frequency applications. Copper cabling links supporting class A applications are specified up to 100 kHz.

Class B — applications include medium bit rate data applications. Copper cabling links supporting class B applications are specified up to 1 MHz.

Class C — applications include high bit rate data applications. Copper cabling links supporting class C applications are specified up to 16 MHz.

Class D — applications include very high bit rate data applications. Copper cabling links supporting class D applications are specified up to 100 MHz.

Optical class applications include high and very high bit rate data applications. Optical fibre cabling links are specified at 10 MHz and above. Bandwidth is generally not a limiting factor in the customer's premises.

Annex G gives examples of applications that fall within the various classes.

7.1.2 Link classification

Generic cabling, when configured to support particular applications, comprises one or more links

For copper cabling links, a class A link is specified so that it will provide the minimum transmission performance to support class A applications. Similarly, class B, C and D links provide the transmission performance to support class B, C and D applications respectively. Links of a given class will support all applications of a lower class. Class A is regarded as the lowest class.

Optical parameters are specified for singlemode and multimode optical fibre links. For optical fibre cabling links, the link is specified so that the minimum transmission performance is supported for applications specified at 10 MHz and above.

Class C and D links correspond to full implementations of category 3 and category 5 horizontal cabling subsystems respectively, as specified in 6.1.

Table 2 relates the link classes to the cabling categories of clauses 8 and 9. This table indicates the

channel length over which the various applications may be supported.

The distances presented are based on crosstalk loss (for copper cables), bandwidth (for optical fibre cables), and attenuation limits for various classes. Other characteristics of applications, for example propagation delay, may further limit these distances.

Table 2 - Channel lengths achievable with different categories and types of cabling

Medium	Channel length				
	Class A	Class B	Class C	Class D	Optical class
Category 3 balanced cable (8.1)	2 km	200 m	100 m 1)	-	-
Category 4 balanced cable (8.1)	3 km	260 m	150 m 3)	-	-
Category 5 balanced cable (8.1)	3 km	260 m	160 m 3)	100 m 1)	-
150 Ω balanced cable (8.2)	3 km	400 m	250 m 3)	150 m 3)	-
Multimode optical fibre (8.4)	N/A	N/A	N/A	N/A	2 km
Singlemode optical fibre (8.5)	N/A	N/A	N/A	N/A	3 km 2)

NOTES

1) The 100 m distance includes a total allowance of 10 m of flexible cable for patch cords / jumpers, work area and equipment connections. Link specifications are consistent with 90 m horizontal cable, 7,5 m electrical length of patch cable and three connectors of the same category. Support for applications is assumed, provided that no more than an additional 7,5 m electrical length of combined work and equipment area cable is used (see figure 7).

2) 3 km is a limit defined by the scope of the International Standard and not a medium limitation.

3) For distances greater than 100 m of balanced cable in the horizontal cabling subsystem, the applicable application standards should be consulted.

Consideration should be given, when specifying and designing cabling, to the possible future connection of cabling subsystems to form longer links. The performance of these longer links will be lower than that of any of the individual subsystem links from which they are constructed. Measurement of links should be made initially, upon installation of each cabling subsystem. Testing of combined subsystems should be performed as required by the application.

7.2 Balanced cabling links

The parameters specified in this subclause apply to cabling links with shielded or unshielded cable elements, with or without an overall shield, unless explicitly stated otherwise. Unless stated otherwise, outline test configurations for all measurements on balanced cabling are given in annex A. Specialised test instruments are required for high frequency field measurements on balanced cabling. The maximum application frequencies are based on required link characteristics, and are not indicated by the maximum specified frequency for the cabling.

7.2.1 Characteristic impedance

The nominal differential characteristic impedance of a cabling link shall be 100 Ω, 120 Ω, or 150 Ω at frequencies between 1 MHz and the highest specified frequency for the cabling class.

The tolerance of the characteristic impedance in a given link shall not exceed the chosen nominal impedance by more than ±15 Ω (f.f.s.) from 1 MHz up to the highest specified frequency for that class.

The variation of the characteristic impedance of a cabling link is characterised by the return loss. The nominal characteristic impedance of cables used in a cabling link shall be in accordance with the requirements of clause 8.

The measurement of these values on installed cabling systems is under study. Verification of the characteristic impedance of cabling links should be made by a suitable design, and the appropriate choice of cables and connecting hardware.

7.2.2 Return loss

The return loss of the cabling, measured at any interface, shall meet or exceed the values shown in table 3. The remote end of the link should be terminated with a resistor of value equal to the nominal impedance of the cabling during the test.

Table 3 - Minimum return loss at each cabling interface

Frequency MHz	**Minimum return loss** dB	
	Class C	**Class D**
1 ≤ f ≤ 10	18 (f.f.s.)	18 (f.f.s.)
10 ≤ f ≤ 16	15 (f.f.s.)	15 (f.f.s.)
16 ≤ f ≤ 20	N/A	15 (f.f.s.)
20 ≤ f ≤ 100	N/A	10 (f.f.s.)

7.2.3 Attenuation

The attenuation of a link shall not exceed the values shown in table 4, and shall be consistent with the design values of cable length and cabling materials used. The attenuation of the link shall be measured according to 3.3.2 of IEC 1156-1, except that the measured attenuation shall not be scaled to a standard length. For class D links, the ACR requirements in 7.2.5 may require lower attenuation than that shown in table 4. Class D links should comprise cables which closely follow the square root of frequency attenuation characteristic above 1 MHz.

The values in table 4 are based on the requirements of the applications listed in annex G.

Table 4 - Maximum attenuation values

Frequency MHz	**Maximum attenuation** dB			
	Class A	**Class B**	**Class C**	**Class D**
0,1	16	5,5	N/A	N/A
1,0	N/A	5,8	3,7	2,5
4,0	N/A	N/A	6,6	4,8
10,0	N/A	N/A	10,7	7,5
16,0	N/A	N/A	14,0	9,4
20,0	N/A	N/A	N/A	10,5
31,25	N/A	N/A	N/A	13,1
62,5	N/A	N/A	N/A	18,4
100,0	N/A	N/A	N/A	23,2

For attenuation measurements that include equipment and work area cables on both ends of a cabling link, the values in table 4 should not be exceeded by more than the attenuation of the equipment and work area cables used.

7.2.4 Near-end crosstalk loss

The near-end crosstalk loss of a link shall meet or exceed the values shown in table 5, and shall be consistent with the design values of cable length and cabling materials used. The crosstalk loss shall be measured according to 3.3.4 of IEC 1156-1 except that the measured near-end crosstalk loss shall not be adjusted for length. The NEXT shall be measured from both ends of the cabling segment to allow a correct evaluation of the cabling link. See also A.1.1. For class D links, the ACR in 7.2.5 may require better near-end crosstalk loss performance than that shown in table 5.

The values in table 5 are based on the near-end crosstalk loss requirements of the applications listed in annex G.

Table 5 - Minimum NEXT loss

Frequency MHz	**Minimum crosstalk loss** dB			
	Class A	**Class B**	**Class C**	**Class D**
0,1	27	40	N/A	N/A
1,0	N/A	25	39	54
4,0	N/A	N/A	29	45
10,0	N/A	N/A	23	39
16,0	N/A	N/A	19	36
20,0	N/A	N/A	N/A	35
31,25	N/A	N/A	N/A	32
62,5	N/A	N/A	N/A	27
100,0	N/A	N/A	N/A	24

For NEXT loss measurements that include equipment and work area cables on both ends of a cabling link, the NEXT loss in table 5 should be met. Equipment connectors are not accounted for in this table and may contribute to additional crosstalk degradation.

Crosstalk is not the only source of noise in a transmission system. An assumption has been made that noise from all other sources is at least 10 dB less than the crosstalk noise power at all application frequencies of interest.

7.2.5 Attenuation to crosstalk loss ratio

This is the difference between the crosstalk loss and the attenuation of the link in dB. It is related to, but distinct from, the signal to crosstalk ratio (SCR) which accommodates the transmit and receive signal levels of an application. By applying the requirements of 7.2.3, 7.2.4 and 7.2.5, the transmission requirements of the applications listed in annex G will be met. The ACR of a link is calculated by:

$$ACR(dB) = a_N(dB) - a(dB)$$

where:

ACR is the attenuation to crosstalk loss ratio

a_N is the crosstalk loss, measured between any two pairs of a link. The crosstalk attenuation shall be measured according to 3.3.4 of IEC 1156-1, except that the measured crosstalk shall not be adjusted for length.

a is the attenuation of the link when measured according to 3.3.2 of IEC 1156-1, except that the measured attenuation shall not be scaled to a standard length.

The ACR is based on the most severe requirements of the applications listed in annex G. The ACR for links of class A, B and C is identical to the values which can be calculated directly from the attenuation and crosstalk loss values shown in tables 4 and 5 respectively. For class D links, the ACR is more demanding than the direct calculation from tables 4 and 5. For class D links, the ACR shall be better than the limits shown in table 6. This provides some flexibility in the choice of cabling components, allowing some limited trade-offs between attenuation (cable length) and crosstalk performance of the cabling.

Table 6 - Minimum ACR values

Frequency MHz	**Minimum ACR** dB
	Class D
1,0	-
4,0	40
10,0	35
16,0	30
20,0	28
31,25	23
62,5	13
100,0	4

For ACR calculations that include equipment and work area cables on both ends of a link, the ACR values in table 6 should not be degraded by more than the attenuation of the equipment and work area cables used.

7.2.6 DC resistance

The loop resistance of pairs shall be less than the values given in table 7 for each class of application. These figures are derived from application requirements. The d.c. loop resistance shall be measured according to 5.1 of IEC 189-1. A short circuit is applied at the remote end of the pair and the loop resistance is measured at the near end. The measured value should be consistent with the length and diameter of the conductors used in the cable.

Table 7 - Maximum d.c. loop resistance

Link class	**Class A**	**Class B**	**Class C**	**Class D**
Maximum loop resistance Ω	560	170	40	40

7.2.7 Propagation delay

The propagation delay, measured as shown in annex A, shall be less than the limits given in table 8. These limits are derived from system requirements. Any measured or calculated values should be consistent with the lengths and materials used in the cabling.

Table 8 - Maximum propagation delay

Measurement Frequency MHz	**Class**	**Delay** µs
0,01	A	20,0
1	B	5,0
10	C	1,0
30	D	1,0

The maximum propagation delay in the horizontal cabling subsystem shall not exceed 1 µs.

7.2.8 Longitudinal to differential conversion loss (balance)

The longitudinal conversion loss, measured as LCL and as LCTL according to ITU-T Recommendation G.117, should exceed the values shown in table 9.

Table 9 - Longitudinal to differential conversion loss

Frequency MHz	**Minimum longitudinal to differential conversion loss** dB			
	Class A	**Class B**	**Class C**	**Class D**
0,1	30	45	35	40
1,0	N/A	20	30	40
4,0	N/A	N/A	f.f.s.	f.f.s.
10,0	N/A	N/A	25	30
16,0	N/A	N/A	f.f.s.	f.f.s.
20,0	N/A	N/A	f.f.s.	f.f.s.
100,0	N/A	N/A	N/A	f.f.s.

The measurement of these values on installed systems is not yet well established. It is sufficient to verify the values by design.

7.2.9 Transfer impedance of shield

This parameter applies to shielded cabling only. The measurement of transfer impedance for installed cabling is not well developed. Connector termination practices may be verified by laboratory measurements of representative samples of short lengths of terminated cable. The transfer impedance requirements for shielded cables and connectors in clauses 8 and 9 should be applied. See clause 10 for guidance on the use of shielded cabling.

Annex 2 Excerpt from ISO/IEC 11801: 2002,

NOTE 1 - This edition was approved for publication 2002 and published 2002-09-30.

NOTE 2 - Equipment and work area are part of the channel.

NOTE 3 – The page numbers 37 to 50 are those of ISO/IEC 11801:2002.

6 Performance of balanced cabling

6.1 General

This clause specifies the minimum performance of generic balanced cabling. The performance of balanced cabling is specified for channels, permanent links and CP links (see Figure 10).

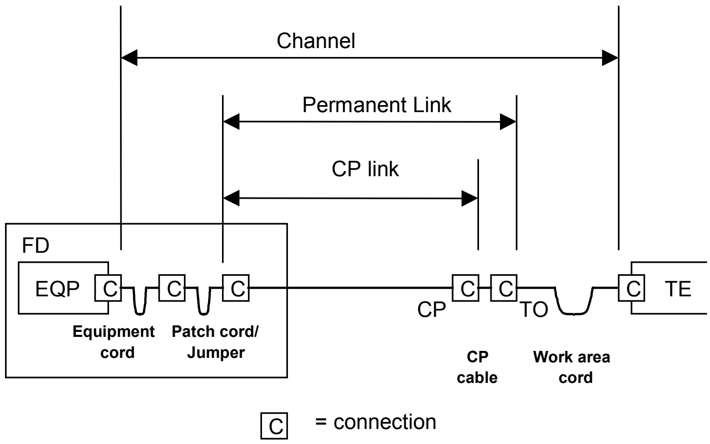

Figure 10 – Channel, permanent link and CP link of a balanced cabling

In the case of cable sharing, additional requirements should be taken into account for balanced cabling. The additional crosstalk requirements for balanced cables are specified in 9.3.

The performance specifications are separated into six classes (A to F) for balanced cabling. This allows the successful transmission of applications over channels according to Annex F which lists the applications and the minimum class required.

The channel performance requirements described in this clause may be used for the design and verification of any implementation of this International Standard. Where required, the test methods defined or referred to by this clause, shall apply. In addition, these requirements can be used for application development and troubleshooting.

The permanent link and CP link performance requirements described in Annex A may be used for acceptance testing of any implementation of this International Standard. Where required, the test methods defined or referred to by Annex A, shall apply.

The specifications in this clause allow for the transmission of defined classes of applications over distances other than those of 7.2, and/or using media and components with different performances than those specified in Clauses 9, 10 and 13.

The channel, permanent link and CP link performance specification of the relevant class shall be met for all temperatures at which the cabling is intended to operate.

There shall be adequate margins to account for temperature dependence of cabling components as per relevant standards and suppliers' instructions. In particular, consideration should be given to measuring performance at worst case temperatures, or calculating worst case performance based on measurements made at other temperatures.

Compatibility between cables used in the same channel or permanent link shall be maintained throughout the cabling system. For example, connections between cables with different nominal impedance shall not be made.

6.2 Layout

The performance of a channel is specified at and between connections to active equipment. The channel comprises only passive sections of cable, connecting hardware, work area cords, equipment cords and patch cords. The connections at the hardware interface to active equipment are not taken into account.

Application support depends on channel performance only, which in turn depends on cable length, number of connections, connector termination practices and workmanship, and performance. It is possible to achieve equivalent channel performance over greater lengths by the use of fewer connections or by using components with higher performance (see also Annex G).

The performance limits for balanced cabling channels are given in 6.4. These limits are derived from the component performance limits of Clause 9 and 10 assuming the channel is composed of 90 m of solid conductor cable, 10 m of cord(s) and four connections (see Figure 10).

Most class F channels are implemented with two connections only. Additional information concerning this implementation is given in Annex H.

Figure 11 shows an example of terminal equipment in the work area connected to transmission equipment using two different media channels, which are cascaded. In fact there is an optical fibre channel (see Clause 8) connected via an active component in the FD to a balanced cabling channel. There are four channel interfaces; one at each end of the balanced channel, and one at each end of the optical fibre channel.

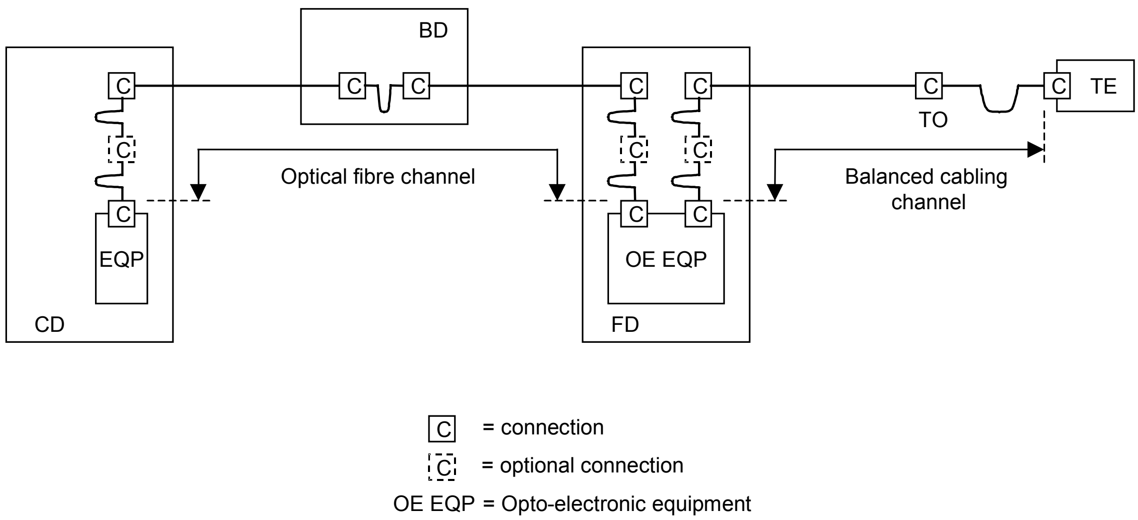

Figure 11 – Example of a system showing the location of cabling interfaces and extent of associated channels

The performance of a permanent link is specified for horizontal cabling at and between the TO and the first patch panel at the other side of the horizontal cable; it may contain a CP. The performance of a CP link is specified for horizontal cabling at and between the CP and the first patch panel at the other side of the horizontal cable. For backbone cabling the permanent link is specified at and between the patch panels at each side of the backbone cable. The permanent link and CP link comprise only passive sections of cable and connecting hardware.

The performance limits for balanced cabling permanent links and CP links are given in Annex A.

The performance limits for balanced cabling permanent links with maximum implementation are also given in Annex A. These limits are derived from the component performance limits of Clauses 9 and 10 assuming the permanent link is composed of 90 m of solid conductor cable and three connections (see Figure 10).

Most class F permanent links are implemented with two connections only. Additional information concerning this implementation is given in Annex H.

6.3 Classification of balanced cabling

This standard specifies the following classes for balanced cabling.

Class A is specified up to 100 kHz.

Class B is specified up to 1 MHz.

Class C is specified up to 16 MHz.

Class D is specified up to 100 MHz.

Class E is specified up to 250 MHz.

Class F is specified up to 600 MHz.

A Class A channel is specified so that it will provide the minimum transmission performance to support Class A applications. Similarly, Class B, C, D, E and F channels provide the transmission performance to support Class B, C, D, E and F applications respectively. Links and channels of a given class will support all applications of a lower class. Class A is regarded as the lowest class.

Channels, permanent links and CP links in the horizontal cabling shall be installed to provide a minimum of Class D performance.

Annex F lists known applications by classes.

6.4 Balanced cabling performance

6.4.1 General

The parameters specified in this subclause apply to channels with screened or unscreened cable elements, with or without an overall screen, unless explicitly stated otherwise.

The nominal impedance of channels is 100 Ω. This is achieved by suitable design and appropriate choice of cabling components (irrespective of their nominal impedance).

The requirements in this subclause are given by limits computed to one decimal place, using the equation for a defined frequency range. The limits for the propagation delay and delay skew are computed to three decimal places. The additional tables are for information only and have limits derived from the relevant equation at key frequencies.

6.4.2 Return loss

The return loss requirements are applicable only to Classes C, D, E and F.

The return loss (*RL*) of each pair of a channel shall meet the requirements derived by the equation in Table 2.

The return loss requirements shall be met at both ends of the cabling. Return loss (*RL*) values at frequencies where the insertion loss (*IL*) is below 3,0 dB are for information only.

When required, the return loss (*RL*) shall be measured according to IEC 61935-1. Terminations of 100 Ω shall be connected to the cabling elements under test at the remote end of the channel.

Table 2 – Return loss for channel

Class	Frequency MHz	Minimum return loss dB
C	$1 \leq f \leq 16$	15,0
D	$1 \leq f < 20$	17,0
	$20 \leq f \leq 100$	$30 - 10\lg(f)$
E	$1 \leq f < 10$	19,0
	$10 \leq f < 40$	$24 - 5\lg(f)$
	$40 \leq f \leq 250$	$32 - 10\lg(f)$
F	$1 \leq f < 10$	19,0
	$10 \leq f < 40$	$24 - 5\lg(f)$
	$40 \leq f < 251,2$	$32 - 10\lg(f)$
	$251,2 \leq f \leq 600$	8,0

Table 3 – Informative return loss values for channel at key frequencies

Frequency MHz	Minimum return loss dB			
	Class C	**Class D**	**Class E**	**Class F**
1	15,0	17,0	19,0	19,0
16	15,0	17,0	18,0	18,0
100	N/A	10,0	12,0	12,0
250	N/A	N/A	8,0	8,0
600	N/A	N/A	N/A	8,0

6.4.3 Insertion loss/attenuation

Previous editions of this standard use the term “attenuation”, which is still widely used in the cable industry. However, due to impedance mismatches in cabling systems, especially at higher frequencies, this characteristic is better described as “insertion loss”. In this edition, the term “insertion loss” is adopted throughout to describe the signal attenuation over the length of channels, links and components. Unlike attenuation, insertion loss does not scale linearly with length.

The term “attenuation” is maintained for the following parameters:

- attenuation to crosstalk ratio (ACR) – see 6.4.5;
- unbalanced attenuation – see 6.4.14;
- coupling attenuation – see 6.4.15.

For the calculation of *ACR, PS ACR, ELFEXT* and *PS ELFEXT*, the corresponding value for insertion loss (*IL*) shall be used.

The insertion loss (*IL*) of each pair of a channel shall meet the requirements derived by the equation in Table 4.

When required, the *insertion loss* shall be measured according to IEC 61935-1.

Table 4 – Insertion loss for channel

Class	Frequency MHz	Maximum insertion loss [a] dB
A	$f = 0{,}1$	16,0
B	$f = 0{,}1$	5,5
	$f = 1$	5,8
C	$1 \le f \le 16$	$1{,}05 \times \left(3{,}23\sqrt{f}\right) + 4 \times 0{,}2$
D	$1 \le f \le 100$	$1{,}05 \times \left(1{,}910\,8\sqrt{f} + 0{,}022\,2 \times f + 0{,}2/\sqrt{f}\right) + 4 \times 0{,}04 \times \sqrt{f}$
E	$1 \le f \le 250$	$1{,}05 \times \left(1{,}82\sqrt{f} + 0{,}016\,9 \times f + 0{,}25/\sqrt{f}\right) + 4 \times 0{,}02 \times \sqrt{f}$
F	$1 \le f \le 600$	$1{,}05 \times \left(1{,}8\sqrt{f} + 0{,}01 \times f + 0{,}2/\sqrt{f}\right) + 4 \times 0{,}02 \times \sqrt{f}$

[a] Insertion loss (*IL*) at frequencies that correspond to calculated values of less than 4,0 dB shall revert to a maximum requirement of 4,0 dB.

Table 5 – Informative insertion loss values for channel at key frequencies

Frequency MHz	Maximum insertion loss dB					
	Class A	**Class B**	**Class C**	**Class D**	**Class E**	**Class F**
0,1	16,0	5,5	N/A	N/A	N/A	N/A
1	N/A	5,8	4,2	4,0	4,0	4,0
16	N/A	N/A	14,4	9,1	8,3	8,1
100	N/A	N/A	N/A	24,0	21,7	20,8
250	N/A	N/A	N/A	N/A	35,9	33,8
600	N/A	N/A	N/A	N/A	N/A	54,6

6.4.4 NEXT

6.4.4.1 Pair-to-pair NEXT

The *NEXT* between each pair combination of a channel shall meet the requirements derived by the equation in Table 6.

The *NEXT* requirements shall be met at both ends of the cabling. *NEXT* values at frequencies where the insertion loss (*IL*) is below 4,0 dB are for information only.

When required, the *NEXT* shall be measured according to IEC 61935-1.

Table 6 – NEXT for channel

Class	Frequency MHz	Minimum NEXT dB
A	$f = 0{,}1$	27,0
B	$0{,}1 \le f \le 1$	$25 - 15\lg(f)$
C	$1 \le f \le 16$	$39{,}1 - 16{,}4\lg(f)$
D	$1 \le f \le 100$	$-20\lg\left(10^{\frac{65{,}3-15\lg(f)}{-20}} + 2\times10^{\frac{83-20\lg(f)}{-20}}\right)$ [a]
E	$1 \le f \le 250$	$-20\log\left(10^{\frac{74{,}3-15\lg(f)}{-20}} + 2\times10^{\frac{94-20\lg(f)}{-20}}\right)$ [b]
F	$1 \le f \le 600$	$-20\lg\left(10^{\frac{102{,}4-15\lg(f)}{-20}} + 2\times10^{\frac{102{,}4-15\lg(f)}{-20}}\right)$ [b]

[a] *NEXT* at frequencies that correspond to calculated values of greater than 60,0 dB shall revert to a minimum requirement of 60,0 dB.

[b] *NEXT* at frequencies that correspond to calculated values of greater than 65,0 dB shall revert to a minimum requirement of 65,0 dB.

Table 7 – Informative NEXT values for channel at key frequencies

Frequency MHz	Minimum channel NEXT dB					
	Class A	Class B	Class C	Class D	Class E	Class F
0,1	27,0	40,0	N/A	N/A	N/A	N/A
1	N/A	25,0	39,1	60,0	65,0	65,0
16	N/A	N/A	19,4	43,6	53,2	65,0
100	N/A	N/A	N/A	30,1	39,9	62,9
250	N/A	N/A	N/A	N/A	33,1	56,9
600	N/A	N/A	N/A	N/A	N/A	51,2

6.4.4.2 Power sum NEXT (PS NEXT)

The *PS NEXT* requirements are applicable only to Classes D, E and F.

The *PS NEXT* of each pair of a channel shall meet the requirements derived by the equation in Table 8.

The PS NEXT requirements shall be met at both ends of the cabling. *PS NEXT* values at frequencies where the insertion loss (*IL*) is below 4,0 dB are for information only.

$PS\ NEXT_k$ of pair k is computed as follows:

$$PS\ NEXT_k = -10\lg \sum_{i=1, i \neq k}^{n} 10^{\frac{-NEXT_{ik}}{10}} \qquad (1)$$

where

i is the number of the disturbing pair;

k is the number of the disturbed pair;

n is the total number of pairs;

$NEXT_{ik}$ is the near end crosstalk loss coupled from pair i into pair k.

Table 8 – PS NEXT for channel

Class	**Frequency** MHz	**Minimum PS NEXT** dB
D	$1 \leq f \leq 100$	$-20\lg\left(10^{\frac{62,3-15\lg(f)}{-20}} + 2\times 10^{\frac{80-20\lg(f)}{-20}}\right)$ [a]
E	$1 \leq f \leq 250$	$-20\lg\left(10^{\frac{72,3-15\lg(f)}{-20}} + 2\times 10^{\frac{90-20\lg(f)}{-20}}\right)$ [b]
F	$1 \leq f \leq 600$	$-20\lg\left(10^{\frac{99,4-15\lg(f)}{-20}} + 2\times 10^{\frac{99,4-15\lg(f)}{-20}}\right)$ [b]

[a] *PS NEXT* at frequencies that correspond to calculated values of greater than 57,0 dB shall revert to a minimum requirement of 57,0 dB.

[b] *PS NEXT* at frequencies that correspond to calculated values of greater than 62,0 dB shall revert to a minimum requirement of 62,0 dB.

Table 9 – Informative PS NEXT values for channel at key frequencies

Frequency MHz	**Minimum PS NEXT** dB		
	Class D	**Class E**	**Class F**
1	57,0	62,0	62,0
16	40,6	50,6	62,0
100	27,1	37,1	59,9
250	N/A	30,2	53,9
600	N/A	N/A	48,2

6.4.5 Attenuation to crosstalk ratio (ACR)

The *ACR* requirements are applicable only to Classes D, E and F.

6.4.5.1 Pair-to-pair ACR

Pair-to-pair *ACR* is the difference between the pair-to-pair *NEXT* and the insertion loss (*IL*) of the cabling in dB.

The *ACR* of each pair combination of a channel shall meet the difference of the *NEXT* requirement of Table 6 and the insertion loss (*IL*) requirement of Table 4 of the respective class.

The *ACR* requirements shall be met at both ends of the cabling.

ACR_{ik} of pairs *i* and *k* is computed as follows:

$$ACR_{ik} = NEXT_{ik} - IL_k \tag{2}$$

where

i is the number of the disturbing pair;

k is the number of the disturbed pair;

$NEXT_{ik}$ is the near end crosstalk loss coupled from pair *i* into pair *k*;

IL_k is the insertion loss of pair *k*. When required, it shall be measured according to IEC 61935-1.

Table 10 – Informative ACR values for channel at key frequencies

Frequency MHz	**Minimum ACR** dB		
	Class D	**Class E**	**Class F**
1	56,0	61,0	61,0
16	34,5	44,9	56,9
100	6,1	18,2	42,1
250	N/A	–2,8	23,1
600	N/A	N/A	–3,4

6.4.5.2 Power sum ACR (PS ACR)

The *PS ACR* of each pair of a channel shall meet the difference of the *PS NEXT* requirement of Table 8 and the insertion loss (*IL*) requirement of Table 4 of the respective class.

The *PS ACR* requirements shall be met at both ends of the cabling.

PS ACR$_k$ of pair *k* is computed as follows:

$$PS\,ACR_k = PS\,NEXT_k - IL_k \qquad (3)$$

where

k is the number of the disturbed pair;

PS NEXT$_k$ is the power sum near end crosstalk loss of pair *k*;

IL$_k$ is the insertion loss of pair *k*. When required, it shall be measured according to IEC 61935-1.

Table 11 – Informative PS ACR values for channel at key frequencies

Frequency MHz	**Minimum PS ACR** dB		
	Class D	**Class E**	**Class F**
1	53,0	58,0	58,0
16	31,5	42,3	53,9
100	3,1	15,4	39,1
250	N/A	–5,8	20,1
600	N/A	N/A	–6,4

6.4.6 ELFEXT

The *ELFEXT* requirements are applicable only to Classes D, E and F.

6.4.6.1 Pair-to-pair ELFEXT

The *ELFEXT* of each pair combination of a channel shall meet the requirements derived by the equation in Table 12.

ELFEXT$_{ik}$ of pairs *i* and *k* is computed as follows:

$$ELFEXT_{ik} = FEXT_{ik} - IL_k \qquad (4)$$

where

i is the number of the disturbed pair;

k is the number of the disturbing pair;

FEXT$_{ik}$ is the far end crosstalk loss coupled from pair *i* into pair *k*. When required, it shall be measured according to IEC 61935-1.

IL$_k$ is the insertion loss of pair *k*. When required, it shall be measured according to IEC 61935-1.

NOTE The ratio of the insertion loss (*IL*) of the disturbed pair to the input-to-output *FEXT* is relevant for the signal-to-noise-ratio consideration. The results computed in accordance with the formal definition above cover all possible combinations of insertion loss of wire pairs and corresponding input-to-output *FEXT*.

Table 12 – ELFEXT for channel

Class	**Frequency** MHz	**Minimum ELFEXT** [a] dB
D	$1 \le f \le 100$	$-20\lg\left(10^{\frac{63{,}8-20\lg(f)}{-20}}+4\times10^{\frac{75{,}1-20\lg(f)}{-20}}\right)$ [b]
E	$1 \le f \le 250$	$-20\lg\left(10^{\frac{67{,}8-20\lg(f)}{-20}}+4\times10^{\frac{83{,}1-20\lg(f)}{-20}}\right)$ [c]
F	$1 \le f \le 600$	$-20\lg\left(10^{\frac{94-20\lg(f)}{-20}}+4\times10^{\frac{90-15\lg(f)}{-20}}\right)$ [c]

[a] *ELFEXT* at frequencies that correspond to measured *FEXT* values of greater than 70,0 dB are for information only.

[b] *ELFEXT* at frequencies that correspond to calculated values of greater than 60,0 dB shall revert to a minimum requirement of 60,0 dB.

[c] *ELFEXT* at frequencies that correspond to calculated values of greater than 65,0 dB shall revert to a minimum requirement of 65,0 dB.

Table 13 – Informative ELFEXT values for channel at key frequencies

Frequency MHz	**Minimum ELFEXT** dB		
	Class D	**Class E**	**Class F**
1	57,4	63,3	65,0
16	33,3	39,2	57,5
100	17,4	23,3	44,4
250	N/A	15,3	37,8
600	N/A	N/A	31,3

6.4.6.2 Power sum ELFEXT (PS ELFEXT)

The *PS ELFEXT* of each pair of a channel shall meet the requirements derived by the equation in Table 14.

$PS\ ELFEXT_k$ of pair *k* is computed as follows:

$$PS\ ELFEXT_k = -10\lg \sum_{i=1, i\neq k}^{n} 10^{\frac{-ELFEXT_{ik}}{10}} \qquad (5)$$

where

i is the number of the disturbing pair;

k is the number of the disturbed pair;

N is the total number of pairs;

$ELFEXT_{ik}$ is the equal level far end crosstalk loss coupled from pair *i* into pair *k*.

Table 14 – PS ELFEXT for channel

Class	Frequency MHz	Minimum PS ELFEXT [a] dB
D	$1 \leq f \leq 100$	$-20\lg\left(10^{\frac{60,8-20\lg(f)}{-20}}+4\times10^{\frac{72,1-20\lg(f)}{-20}}\right)$ [b]
E	$1 \leq f \leq 250$	$-20\lg\left(10^{\frac{64,8-20\lg(f)}{-20}}+4\times10^{\frac{80,1-20\lg(f)}{-20}}\right)$ [c]
F	$1 \leq f \leq 600$	$-20\lg\left(10^{\frac{91-20\lg(f)}{-20}}+4\times10^{\frac{87-15\lg(f)}{-20}}\right)$ [c]

[a] *PS ELFEXT* at frequencies that correspond to measured *FEXT* values of greater than 70,0 dB are for information only.

[b] *PS ELFEXT* at frequencies that correspond to calculated values of greater than 57,0 dB shall revert to a minimum requirement of 57,0 dB.

[c] *PS ELFEXT* at frequencies that correspond to calculated values of greater than 62,0 dB shall revert to a minimum requirement of 62,0 dB.

Table 15 – Informative PS ELFEXT values for channel at key frequencies

Frequency MHz	Minimum PS ELFEXT dB		
	Class D	Class E	Class F
1	54,4	60,3	62,0
16	30,3	36,2	54,5
100	14,4	20,3	41,4
250	N/A	12,3	34,8
600	N/A	N/A	28,3

6.4.7 Direct current (d.c.) loop resistance

The d.c. loop resistance of each pair of a channel shall meet the requirements in Table 16.

When required, the d.c. loop resistance shall be measured according to IEC 61935-1.

Table 16 – Direct current (d.c.) loop resistance for channel

Maximum d.c. loop resistance Ω					
Class A	Class B	Class C	Class D	Class E	Class F
560	170	40	25	25	25

6.4.8 Direct current (d.c.) resistance unbalance

The d.c. resistance unbalance between the two conductors within each pair of a channel shall not exceed 3 % for all classes. This shall be achieved by design.

6.4.9 Current carrying capacity

The minimum current carrying capacity for channels of Classes D, E and F shall be 0,175 A d.c. per conductor for all temperatures at which the cabling will be used. This shall be achieved by an appropriate design.

6.4.10 Operating voltage

The channels of classes D, E and F shall support an operating voltage of 72 V d.c. between any conductors for all temperatures at which the cabling is intended to be used.

6.4.11 Power capacity

The channels of classes D, E and F shall support the delivery of a power of 10 W per pair for all temperatures at which the cabling is intended to be used.

6.4.12 Propagation delay

The propagation delay of each pair of a channel shall meet the requirements derived by the equation in Table 17.

When required, the propagation delay shall be measured according to IEC 61935-1.

Table 17 – Propagation delay for channel

Class	Frequency MHz	Maximum propagation delay µs
A	$f = 0{,}1$	20,000
B	$0{,}1 \leq f \leq 1$	5,000
C	$1 \leq f \leq 16$	$0{,}534 + 0{,}036/\sqrt{f} + 4 \times 0{,}002\,5$
D	$1 \leq f \leq 100$	$0{,}534 + 0{,}036/\sqrt{f} + 4 \times 0{,}002\,5$
E	$1 \leq f \leq 250$	$0{,}534 + 0{,}036/\sqrt{f} + 4 \times 0{,}002\,5$
F	$1 \leq f \leq 600$	$0{,}534 + 0{,}036/\sqrt{f} + 4 \times 0{,}002\,5$

Table 18 – Informative propagation delay values for channel at key frequencies

Frequency MHz	**Maximum propagation delay** µs					
	Class A	**Class B**	**Class C**	**Class D**	**Class E**	**Class F**
0,1	20,000	5,000	N/A	N/A	N/A	N/A
1	N/A	5,000	0,580	0,580	0,580	0,580
16	N/A	N/A	0,553	0,553	0,553	0,553
100	N/A	N/A	N/A	0,548	0,548	0,548
250	N/A	N/A	N/A	N/A	0,546	0,546
600	N/A	N/A	N/A	N/A	N/A	0,545

6.4.13 Delay skew

The delay skew between all pairs of a channel shall meet the requirements in Table 19.

When required, the delay skew shall be measured according to IEC 61935-1.

Table 19 – Delay skew for channel

Class	**Frequency** MHz	**Maximum delay skew** µs
A	$f = 0{,}1$	N/A
B	$0{,}1 \leq f \leq 1$	N/A
C	$1 \leq f \leq 16$	0,050 [a]
D	$1 \leq f \leq 100$	0,050 [a]
E	$1 \leq f \leq 250$	0,050 [a]
F	$1 \leq f \leq 600$	0,030 [b]

[a] This is the result of the calculation 0,045 + 4 × 0,001 25.

[b] This is the result of the calculation 0,025 + 4 × 0,001 25.

6.4.14 Unbalance attenuation

The unbalance attenuation near end (longitudinal to differential conversion loss (*LCL*) or transverse conversion loss (*TCL*)) of a channel shall meet the requirements derived by the equation in Table 20.

The unbalance attenuation requirements shall be met at both ends of the cabling.

The unbalance attenuation performance shall be achieved by the appropriate choice of cables and connecting hardware.

Table 20 – Unbalance attenuation for channel

Class	**Frequency** MHz	**Maximum unbalance attenuation** dB
A	f = 0,1	30
B	f = 0,1 and 1	45 at 0,1 MHz; 20 at 1 MHz
C	1 ≤ f ≤ 16	$30 - 5\lg(f)$ f.f.s.
D	1 ≤ f ≤ 100	$40 - 10\lg(f)$ f.f.s.
E	1 ≤ f ≤ 250	$40 - 10\lg(f)$ f.f.s.
F	1 ≤ f ≤ 600	$40 - 10\lg(f)$ f.f.s.

6.4.15 Coupling attenuation

The measurement of coupling attenuation for installed cabling is under development. Coupling attenuation of a sample installation may be assessed by laboratory measurements of representative samples of channels assembled, using the components and connector termination practices in question.

7 Reference implementations for balanced cabling

7.1 General

This clause describes implementations of generic balanced cabling that utilise components and assemblies referenced in Clauses 9, 10 and 13. These reference implementations meet the requirements of Clause 5 and, when installed in accordance with ISO/IEC TR 14763-2, comply with the channel performance requirements of Clause 6.

7.2 Balanced cabling

7.2.1 General

Balanced components referenced in Clauses 9 and 10 are defined in terms of impedance and category. In the reference implementations of this clause, the components used in each cabling channel shall have the same nominal impedance, i.e. 100 Ω for Classes D to F and 100 Ω or 120 Ω for Class A to Class C.

The implementations are based on component performance at 20 °C. The effect of temperature on the performance of cables shall be accommodated by derating length as shown in Table 21 and Table 22.

Cables and connecting hardware of different categories may be mixed within a channel. However, the resultant cabling performance will be determined by the category of the lowest performing component.

7.2.2 Horizontal cabling

7.2.2.1 Component choice

The selection of balanced cabling components will be determined by the class of applications to be supported. Refer to Annex F for guidance.

From: Kevin Brown [kbrown@broadcom.com]
Sent: Sunday, March 09, 2003 7:17 PM
To: bob.grow@intel.com
Cc: David_Law@3Com.com; teener@apple.com; PJohansson@acm.org
Subject: RE: 802.3 - 1394 Liason

Hello Bob,

David Law suggested I bring this to your attention.

I have had some discussions recently with members of the 1394 Trade Association. There is interest in that group in potentially incorporating 802.3 physical layer technology into future drafts of 1394. A 1394 Study Group has been formed to pursue this, with Michael Teener of Apple as the chair.

Specifically, we have talked about the potential for sending 800 Mbps data ("S800") from a 1394 "link layer" (MAC equivalent) thru a 1000BASE-T type of PHY, to enable 100 meter UTP links for 1394 S800.

As part of that concept, there is interest in defining an autonegotiation protocol to allow a link to be negotiated to run 802.3 (10/100/1000) or 1394. That would like involved some changes to 802.3 autonegotiation, which may be a simple as giving new defition to some of the existing reserved negotation bits. In particular, in 802.3 Annex 28C, "Table 28C-1-Message code field values", we would like to use Message Code #'s which are are currently "Reserved for future Auto-Negotiation use".

I have been asked to establish a liason with 802.3 for discussion of this subject.

I'm unfamiliar with the proper protocol for such discussions, but would appreciate your direction. We would like to make the 802.3 community aware of the interest from 1394, and to coordinate on the autonegotiation issue.

Please let me know how you think we should proceed. I will be in Dallas for the 802.3 meeting this week.

Thanks,

Kevin Brown
kbrown@broadcom.com
949-702-1151 mobile

Chairman of IEEE 802.11
Stuart J. Kerry, Mr.
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Publicity Chair IEEE 802.11
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February 11, 2003

Chair, IEEE 802.3af DTE Power via MDI Task Force
Steven B. Carlson
High Speed Design, Inc.
11929 NW Old Quarry Road
Portland, OR 97229
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scarlson@hspdesign.com

RE: IEEE P802.11 liaison

Dear Steve Carlson,

The recent communication with ISO/IEC JTC 1/SC 25/WG 3 regarding cabling standards with respect to remote powered devices points out the need to communicate more effectively between IEEE P802.3af and IEEE P802.11. We believe that it would be beneficial for the membership of P802.11 to receive periodic brief updates as to the status of P802.3af. Thus, it is proposed that a formally recognized liaison relationship be established between the two groups. We can address any further details at the upcoming Dallas Plenary meeting of IEEE P802. Upon your concurrence, at the next IEEE P802.11 meeting a solicitation will be made for a volunteer to be the IEEE P802.11 liaison to P802.3af. We look forward to your response.

Respectfully,

Stuart J. Kerry
Chair IEEE P802.11

Brian D. Mathews
Publicity Chair IEEE P802.11

INTERNATIONAL TELECOMMUNICATION UNION

TELECOMMUNICATION STANDARDIZATION SECTOR

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STUDY GROUP 15 – REPORT 40

Source: STUDY GROUP 15

Title: REPORT OF WORKING PARTY 5/15, PROJECTS AND PROMOTION (Geneva, 23-31 January 2003)
PART I.3 - OTN - Standardization and Work Plan (issue 3)

Structure of the report of the fourth meeting of Study Group 15
(Geneva, 23-31 January 2003)

COM 15-R	Report of	Observations
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31	WP 1/15	**PART II-A** –
32	WP 2/15	**PART I** - General
33	WP 2/15	**PART II-A** –
34	WP 3/15	**PART I** - General
35	WP 3/15	**PART II-A** –
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37	WP 4/15	**PART II-A** –
38 39 40	WP 5/15	**PART I.1** - General **PART I.2** - ANT Standardization (issue 7) and Work Plan (issue 6) **PART I.3** - OTN - Standardization and Work Plan (issue 3)
41	SG 15	Implementors' Guide for Recommendation G.168
42	SG 15	Implementors' Guide for Recommendation G.773
43	SG 15	Implementors' Guide for Recommendation G.983.2
44	SG 15	Implementors' Guide for Recommendation I.751

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Optical Transport Networks & Technologies

Standardization Work Plan

Issue 3, January 2003

1. General

Optical Transport Networks & Technologies Standardization Work Plan is a living document. It may be updated even between meetings. The latest version can be found at the following URL.

http://www.itu.int/itudoc/itu-t/com15/otn/index.html

Proposed modifications and comments should be sent to:

Mark Jones

mark.jones@mail.sprint.com

Tel. +1 913 794 2139

Fax. +1 913 794 0415

2. Introduction

Today's global communications world has many different definitions for optical transport networks and many different technologies that support them. This has resulted in a number of different Study Groups within the ITU-T, e.g. SG 4, 11, 13, 15 developing Recommendations related to optical transport. Moreover, other standards bodies, fora and consortia are also active in this area.

Recognising that without a strong coordination effort there is the danger of duplication of work as well as the development of incompatible and non-interoperable standards, the WTSA 2000 designated Study Group 15 as Lead Study Group on Optical Technology, with the mandate to:

- study the appropriate core Questions (Question 9, 11, 12, 14, and 16/15),
- define and maintain overall (standards) framework, in collaboration with other SGs and standards bodies),
- coordinate, assign and prioritise the studies done by the Study Groups (recognising their mandates) to ensure the development of consistent, complete and timely Recommendations,

Study Group 15 entrusted WP 5/15, under Question 19/15, with the task to manage and carry out the Lead Study Group activities on Optical Technology. To maintain differentiation from the standardized Optical Transport Network (OTN) based on Recommendation G.872, this Lead Study Group Activity is titled Optical Transport Networks & Technologies (OTNT).

3. Scope

As the mandate of this Lead Study Group role implies, the standards area covered relates to optical transport networks and technologies. The optical transport functions include:

- multiplexing function
- cross connect function, including grooming and configuration

- management functions
- physical media functions.

The outcome of the Lead Study Group activities is twofold, consisting of a:

- standardization plan
- work plan,

written as a single document until such time as the distinct pieces warrant splitting it into two.

Apart from taking the Lead Study Group role within the ITU-T, Study Group 15 will also endeavour to cooperate with other relevant organizations, such as ETSI, Committee T1, ISO/IEC etc.

4. Abbreviations

ASON	Automatically Switched Optical Network
ASTN	Automatically Switched Transport Network
ETSI	European Telecommunications Standards Institute
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MON	Metropolitan Optical Network
OTN	Optical Transport Network
OTNT	Optical Transport Networks & Technologies
SDH	Synchronous Digital Hierarchy
SONET	Synchronous Optical NETwork
WTSA	World Telecommunications Standardization Assembly

5. Definitions & Descriptions

One of the most complicated factors of coordinating work of multiple organizations in the area of OTNT are the differences in terminology. Often multiple different groups are utilising the same terms with different definitions. This section includes definitions relevant to this document. See Annex A for more information on how common terms are used in different organizations.

5.1 Optical Transport Networks & Technologies (OTNT)

The transmission of information over optical media in a systematic manner is an optical transport network. The optical transport network consists of the networking capabilities and the technology required to support them. For the purposes of this standardization and work plan, all new optical transport networking functionality and the related technologies will be considered as part of the OTNT Standardization Work Plan. The focus will be the transport and networking of digital payloads over fiber optic cables. Though established optical transport mechanisms such Synchronous Digital Hierarchy (SDH) may fall within this broad definition, only standardization efforts relating to new networking functionality of SDH will be actively considered as part of this Lead Study Group activity.

5.2 Optical Transport Network (OTN)

An Optical Transport Network (OTN) is composed of a set of Optical Network Elements connected by optical fibre links, able to provide functionality of transport, multiplexing, routing, management, supervision and survivability of optical channels carrying client signals, according to the requirements given in Recommendation G.872.

A distinguishing characteristic of the OTN is its provision of transport for any digital signal independent of client-specific aspects, i.e. client independence. As such, according to the general functional modeling described in Recommendation G.805, the OTN boundary is placed across the Optical Channel/Client adaptation, in a way to include the server specific processes and leaving out the client specific processes, as shown in Figure 5-1.

NOTE - The client specific processes related to Optical Channel/Client adaptation are described within Recommendation G.709.

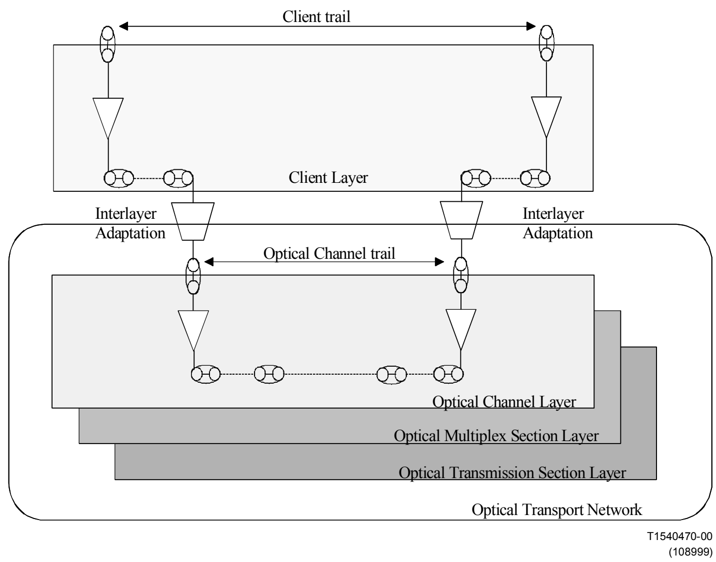


FIGURE 5-1/OTNT: Boundary Of An Optical Transport Network And Client-Server Relationship

5.3 Metropolitan Optical Network (MON)

A metropolitan optical network is a network subset, often without significant differentiation or boundaries. Therefore an explicit definition is under study. As a result, this section offers more of a description than a formal definition for those who wish to better understand what is commonly meant by "metropolitan optical networks."

While the existence of metropolitan networks is longstanding, the need for identification of these networks as distinct from the long haul networks in general, as well as the enterprise and access networks is recent. The bandwidth requirements from the end customers have been increasing substantially and many are implementing high bandwidth optical access connections. The resulting congestion and complexity has created a growing demand for higher bandwidth interfaces for inter office solutions. This aggregation of end customer traffic comprises a Metropolitan Optical Network (MON). MONs now have the technology to be optical based and thus, in theory, use the same technology over the fibres as other portions of the network. However, this is not always the case as there are various market forces that drive which technologies will be deployed in which part of the network. As a result, it is appropriate to describe the MON in a way that is agnostic to the various technology approaches. In spite of the many similarities, there are several distinctions between metropolitan and long haul optical networks (LHONs) that result from the aggregation of traffic from enterprise to metro to long haul networks as shown in Figure 5-2.

- The first distinction is that MONs are inherently designed for short to medium length distances in metropolitan areas. That is, typically, within the limits of a single optical span and often less than 200km distance. As a result, topics such as signal regeneration, in-line amplification and error correction are of lesser importance than in LHONs.
- Secondly, the driving requirement for MONs is maximized coverage commensurate with low cost connectivity (as opposed to grooming for performance with LHONs). As a result, for example, standardization focuses on the adaptation of local area network technologies to be effectively managed by service providers, on 'insertion loss' amplification to recover from all the connection points, and on ring deployment to leverage existing fibre plant.
- Another key difference is that of service velocity. The demand for fast provisioning results in the circuit churn rate being generally higher in MONs than LHON. That combined with the wider variety of client signals is a key driver for flexible aggregation (e.g., 100Mb-1Gb rate, all 8B/10B formats with one card).
- A final distinction is that in the MON there are service requirements (e.g., bandwidth-on-demand services, and multiple classes-of-services) that lead to further topology and technical considerations that are not a priority for LHONs.

While there are many combinations of technologies that can be used in MONs, the following are common examples:

- SONET/SDH
- DWDM, CWDM
- Optical Ethernet
- Resilient Packet Ring
- APON and EPON

As a result of the importance of MONs, SG15 has redefined several of its Questions work programs to specifically include metro characteristics of optical networks.

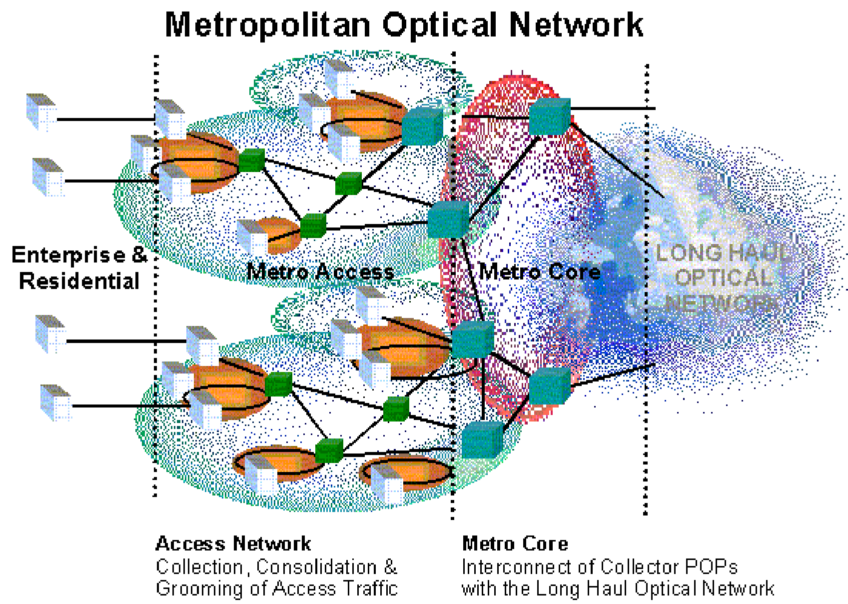


FIGURE 5-2/OTNT: Possible Relationship of MON and LHON

{Editor's note: A description of Ethernet over Transport is under study for inclusion here.}

6. OTNT Correspondence and Liaison Tracking

6.1 OTNT Related Contacts

The International Telecommunication Union - Telecommunications Sector (ITU-T) maintains a strong focus on global OTNT standardization. It is supported by other organizations that contribute to specific areas of the work at both the regional and global levels. Below is a list of the most notable organizations recognised by the ITU-T and the contact points for more information about their activity. Organizations not recognised by the ITU-T are included in informative Annex B.

TABLE 6-1/OTNT: Contacts for OTNT Related Standards Organizations and Fora

Organization	Web Homepage	Contact	Status/Notes
ITU-T SG4 Telecommunication management, including TMN	http://www.itu.int/ITU-T/studygroups/com04/index.html	Mr. David J. Sidor Nortel Networks (USA) 4008 East Chapel Hill-Nelson Highway MS D15000B6 Research Triangle Park North Carolina 27709 USA Tel: +1 919 997 3628 Fax: +1 919 991 7085 Email: djsidor@nortelnetworks.com	
ITU-T Working Party 1/4 Designations, Performance and Test equipment)		Mr. Frank Coenning Acterna Postfach 1262 D-72795 Eningen Germany Tel.: +49 7121 86 1313 Fax: +49 7121 86 2029 Email: frank.coenning@acterna.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.3/4(WP1) Transport network and service operations procedures for performance and fault management		Peter Huckett Acterna UK Ltd, Portland House, Aldermaston Park, ALDERMASTON, Berkshire, RG7 4HR United Kingdom Tel. +44 1245 401 329 Fax. +44 1245 401 334 E-mail : peter.huckett@acterna.com	
ITU-T Q.4/4(WP1) Test and measurement techniques and instrumentation for use on telecommunications systems and their constituent parts		Wolfgang Miller Acterna Eningen GmbH Mühleweg 5, D-72800 Eningen Germany Tel. +49 7121 861328 Fax. +49 7121 862054 E-mail : wolfgang.miller@acterna.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T SG13 Multi-protocol and IP-based networks and their internetworking	http://www.itu.int/ITU-T/com13/index.html	Chairman: Mr. B.W. Moore Lucent Technologies 6 Scott Drive Colchester Essex C03 4JD United Kingdom Tel.: +44 1206 76 23 35 Fax: +44 1206 76 23 36 E-mail: moore@bwmc.demon.co.uk	
ITU-T Working Party 2/13 Architectures and Internetworking Principles		Chairman: Mr. C.-S. Lee Korea Telecom Geneva Liaison Officer 64 Chemin Auguste Vilbert, 1218 Grand-Saconnex, Geneva Switzerland Tel: +41 22 788 44 60 Mobile: +41 79 248 2207 Fax: +41 22 788 44 61 E-mail: chae-sub.lee@ties.itu.int	
ITU-T Q.10/13(WP2) Core Network Architecture and Interworking Principles		Rapporteur: Mr. N. MORITA NTT 3-9-11, Midori-Cho, Musashino-Shi Tokyo 180-8585 Japan Tel.: +81 422 59 7464 Fax: +81 422 59 4646 Email: morita.naotaka@lab.ntt.co.jp	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Working Party 3/13 Multi-protocol Networks and Mechanisms		Chairman: Yoichi MAEDA Head, supervisor Access system Evolution Group & Business Access System Group Optical Access Systems Project Access Network Service Systems Laboratories NTT Corporation 1-6, Nakase, Mihama-ku, Chiba-shi, Chiba 261-0023 Japan Tel: +81 43 211 3274 Fax: +81 43 211 8282 E-mail: maeda@ansl.ntt.co.jp	
ITU-T Q.11/13(WP3) Mechanisms to Allow IP-Based Services Using MPLS to Operate in Public Networks		Rapporteur: Mr. M. CARUGI France Telecom FTR&D/DAC 2 avenue Pierre Marzin 22300 Lannion Cedex France Tel: +332 9605 3617 Fax: +332 9605 1852 Email: marco.carugi@francetelecom.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Working Party 4/13 Network Performance and Resource Management		Chairman: Mr. N. Seitz US Dept. of Commerce NTIA/ITS.N 325 Broadway Boulder, Co. 80303-3328 United States Tel.: +1 303 497 3106 Fax: +1 303 497 5969 E-mail: neal@ntia.its.bldrdoc.gov	
ITU-T Q.8/13(WP4) Transmission Error and Availability Performance		Rapporteur: Mr. G. GARNER Lucent Technologies 101 Crawfords Corner Rd Room 3C-511 Homdel, NJ 07733 USA Tel: +1 732 949 0374 Fax: +1 732 949 3210 Email: gmgarner@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T SG15 Optical and other transport networks	http://www.itu.int/ITU-T/com15/index.html	Chairman: Mr. Peter H. K. Wery Nortel Networks P.O. Box 3511, Station C Ottawa Ontario K1Y 4H7 Canada Tel: +1 613 763-7603 Fax: +1 613 763-2697 Email: wery@nortelnetworks.com	
ITU-T Working Party 1/15 Network Access		Chairman: Mr. Andrew Nunn BT 1, Andrew Close Leiston Suffolk, IPI6 4LE United Kingdom Tel: +44 1728 83 04 62 Fax: +44 1728 83 04 62 Email: andrew.nunn@btinternet.com	
ITU-T Q.2/15 Optical systems for access networks (WP1)		Rapporteur: Mr. Dave Faulkner BtexaCT Adastral Park Martlesham Heath Ipswich IP5 3RE United Kingdom Tel: +44 1473 64 2085 Fax: +44 1473 64 6445 Email: dave.faulkner@bt.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Working Party 3/15 OTN Structure		Chairman: Mr. Stephen J. Trowbridge Lucent Technologies 11900 N. Pecos St. Room 31G56 Denver, Co. 80234 USA Tel: +1 303 920 6545 Fax: +1 303 920 6553 Email: sjtrowbridge@lucent.com	
ITU-T Q.9/15 Transport equipment and network protection/restoration (WP3)		Rapporteur: Mr. Ghani Abbas Marconi Communications Ltd. Technology Drive Beeston, Nottingham United Kingdom Tel:+44 115 906 4036 Cellular: +44 410 370 367 Fax:+44 115 906 4346 E-mail: ghani.abbas@marconi.com	
ITU-T Q.11/15 Signal structures, interfaces and interworking for transport networks (WP3)		Rapporteur: Mr. Gilles Joncour France Telecom R&D RTA/D2M Technopole Anticipa av. Pierre Marzin 22307 Lannion Cédex France Tel: +33 2 96 05 24 69 Fax: +33 2 96 05 12 52 Email:gilles.joncour@francetelecom.com	

Organization	Web Homepage	Contact	Status/Notes
ITU-T Q.12/15 Technology Specific Transport Network Architectures (WP3)		Rapporteur: Mr. Malcolm Betts Nortel Networks Canada Tel: +1 613 763 7860 Fax: +1 613 763 6608 email: betts01@nortelnetworks.com	
ITU-T Q.13/15 Network Synchronization and Time Distribution Performance (WP3)		Rapporteur: Jean Loup Ferrant Alcatel Centre de Villarceaux 91625 Nozay France Tel: +33 1 6449 2307 Fax: +33 1 6449 2956 Email: jean-loup.ferrant@alcatel.fr	
ITU-T Q.14/15 Network management for transport systems and equipment (WP3)		Rapporteur: Mr. Hing Kam Lam Lucent Technologies 101 Crawford Corner Road, Room 4C-616A Holmdel, NJ 07733 USA Tel: +1 732 949-8338 Fax: +1 732 949-5055 Email: hklam@lucent.com	

Organization	**Web Homepage**	**Contact**	**Status/Notes**
ITU-T Working Party 4/15 OTN Technology		Chairman: Mr. Gastone Bonaventura Telecom Italia Viale Europa 190 00144 Roma Italy Cell: +39 335 382905 Tel: +39 06 3687 5740 Fax: +39 06 3687 5115 Email: gastone.bonaventura@telecomitalia.it	
ITU-T Q.15/15 Characteristics and test methods of optical fibres and cables (WP4)		Rapporteur: Mr. William B. Gardner Lucent Technologies 2000 NE Expressway, 1H31 Norcross, GA, 30071 USA Tel: +1 770 798 2674 Fax: +1 770 798 4654 Email: wbgardner@lucent.com	
ITU-T Q.16/15 Characteristics of optical systems for terrestrial transport networks (WP4)		Rapporteur: Mr. John Eaves TyCom Labs Rm. 1C-240 250 Industrial Way West Eatontown NJ 07724 USA Tel: +1 732 578 7471 Fax: +1 732 578 7502 Email: jeaves@tycomltd.com	

Organization	**Web Homepage**	**Contact**	**Status/Notes**
ITU-T Q.17/15 Characteristics of optical components and subsystems (WP4)		Rapporteur: Mr. James Matthews III Corning Inc. 8 E. Denison Pkwy Corning, NY M831 USA Tel: +1 607 974 7608 Fax: +1 607 974 4941 Email: matthewsje@corning.com	
ITU-T Q.18/15 Characteristics of optical fibre submarine cable systems (WP4)		Rapporteur: Mr. Masaharu Ohashi NTT Access Network Service Systems Labs 1-7-1, Hanabatake, Tsukuba, Ibaraki, 306-0805 Japan Tel:+81 29 287 7263 Fax:+81 29 287 7389 E-mail: ohashi@ansl.ntt.co.jp	
ITU-T Working Party 5/15 Projects and Promotion		Chairman: Mr. Haruo Okamura Corning International K.K. 1-14-14, Akasaka, Minato-ku Tokyo 107-0052 Japan Tel: +81 3 3586 1398 Fax: +81 3 3587 0906 E-mail: okamurah@corning.com	

Organization	**Web Homepage**	**Contact**	**Status/Notes**
ITU-T Q.19/15 General characteristics of optical transport networks (WP5)		Rapporteur: Mr. Mark Loyd Jones Sprint Mailstop: KSOPHD0404-4D330 6220 Sprint Parkway Overland Park, KS 66212 USA Tel: +1 913 794 2139 Fax: +1 913 794 0415 mark.jones@mail.sprint.com	
Committee T1	http://www.t1.org	Chair: Mr. E.R. Hapeman (Ray) Telcordia Technologies 331 Newman Springs Rd Room 2C-405 Red Bank, NJ 07701-5699 E-mail: rhapeman@telcordia.com Tel: (732) 758-2239 FAX: (732) 758-4545	
T1X1 Digital Hierarchy and Synchronization	http://www.t1.org/t1x1/t1x1.htm	Chair: Mr. Ken Biholar Alcatel USA Inc. 1000 Coit Road, MS PB7-026 Plano, Texas 75075 Tel: +1 972 477-9148 Fax: +1 972 519-2460 ken.biholar@usa.alcatel.com	
T1X1.3 Synchronization and Tributary Analysis Interfaces	http://www.t1.org/t1x1/_x13-hm.htm	Chair: Mr. Adam Wertheimer Telcordia Technologies 445 South Street MCC 1A-140G Morristown, NJ 07960-6438 Tel: (973) 829-2635 Fax: (973) 829-5866 E-mail: adam.wertheimer@telcordia.com	

Organization	Web Homepage	Contact	Status/Notes
T1X1.5 Optical Hierarchical Interfaces	http://www.t1.org/t1x1/_x15-hm.htm	Chair: Ms. Deborah A. Brungard AT&T Labs Room C1-2A06 200 Laurel Ave S Middletown, NJ 07748 Phone: (732) 420-1573 Fax: (732) 834-0047 dbrungard@att.com	
TIA - Telecommunications Industry Association	http://www.tiaonline.org	Chairman of the Board of Directors: Ed Kientz Benner-Nawman, Inc. 3450 Sabin Brown Rd. Wickenburg, AZ 85390 Tel: (800) 528-5502 Fax: (520) 684-7041	
TIA FO-2 Optical Communications	http://www.tiaonline.org/standards/sfg/committee.cfm?comm=fo%2D2&name=Optical%20Communications	Chair: Mr. Felix Kapron, Corning Incorporated Tel. +1 607-974-7156 E-mail: KapronFP@corning.com	
TIA FO-4.1 Single Mode Systems		Chair: Mr. Allen H. Cherin, Lucent Technologies Tel. +1 770-798-2619 Fax +1 770-798-4654 E-mail: cherin@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
TIA FO-4.5 Optically Amplified Devices, Subsystems and Systems		Chair: Mr. James Matthews III Corning Inc. 8 E. Denison Pkwy Corning, NY M831 USA Tel: +1 607 974 7608 Fax: +1 607 974 4941 Email: matthewsje@corning.com	
IEC - International Electrotechnical Commission	http://www.iec.ch/		
Subcommittee 86A: Fibres And Cables	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86A	Chairman: Dr. Günter H. ZEIDLER Erikastrasse 3A DE - 82110 GERMERING GERMANY Tel: +49 89 841 24 68 Fax: +49 89 840 06 301 ou/or Tel.: +49 89 840 06 301 E-mail: gunter.zeidler@t-online.de	
SC 86A/WG 1: Fibres and associated measuring methods	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1418	Convenor: Dr. Allen CHERIN Lucent Technologies 2000 Northeast Expressway US - NORCROSS, GA 30071 UNITED STATES OF AMERICA Tel: +1 770 798 2613 Fax: +1 770 798 4654 E-mail: acherin@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86A/WG 3: Cables	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1419	Convenor: Mr. A.J. WILLIS B.I.C.C. Helsby GB - WARRINGTON WA6 0DJ UNITED KINGDOM Tel: +44 1928 728 231 Fax: +44 1928 728 301 E-mail: awillis@brand-rex.com	
Subcommittee 86B: Fibre Optic Interconnecting Devices And Passive Components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86B	Chairman: Mr. B.G. LEFEVRE AT & T Network Cable Systems Room 2B33 2000 NE Expressway US - NORCROSS, GA 30071 UNITED STATES OF AMERICA Tel: +1 770 798 2837 Fax: +1 770 798 2690 E-mail: blefevre@lucent.com	
SC 86B/WG 4: Standard tests and measurement methods for fibre optic interconnecting devices and passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1106	Convenor: Mr. Tom BOLHAAR AMP Holland B.V. Dept. Fiber Optic Connections Rietveldenweg 32 P.O. Box 288 NL - 5201 AG'S - HERTOGENBOSCH THE NETHERLANDS Tel: +31 73 624 6453 Fax: +31 73 624 6917 E-mail: t.bolhaar@tycoelectronics.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86B/WG 5: Reliability of fibre optic interconnecting devices and passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1107	Convenor: Dr. Felix P. KAPRON Corning Inc Opto - Electronics MP - QX - 02 8, East Dennison Parkway US - CORNING, NEW YORK 14831 UNITED STATES OF AMERICA Tel: +1 607 974 7156 E-mail: kapronfp@corning.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86B/WG 6: Standards and specifications for fibre optic interconnecting devices and related components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1108	Convenor: Mr. Philip LONGHURST Corp. Fibre Optics Research Manager LEMO Fibre Optics Unit of Research Unit 6 Riverside Business Centre Shoreham by Sea GB - WEST SUSSEX BN43 6RE UNITED KINGDOM Tel: +44 1273 466 920 Fax: +44 1273 466 921 E-mail: plonghurst@lemo.ch Co-convenor: Mr. Des POOLE 3M United Kingdom Customer Technical Centre Easthampstead Road Bracknell GB - BERKSHIRE RG12 1JE UNITED KINGDOM Tel: +44 1 344 866 300 Fax: +44 1 344 866 309 E-mail: dpoole@mmm.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86B/WG 7: Standards and specifications for fibre optic passive components	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1658	Convenor: Mr. Brian KAWASAKI JDS FITEL Inc. 570 West Hunt Club Road CA - NEPEAN, ONTARIO K2G 5W8 CANADA Tel: +1 613 727 1304 Fax: +1 613 727 8284 Tel: +1 613 727 1304 ext 211 E-mail: brian_kawasaki@jdsuniphase.com	
Subcommittee 86C: Fibre Optic Systems And Active Devices	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirdet.p&committee=SC&number=86C	Chairman: Dr. Pietro M. DI VITA Telecom Italia Lab Via G. Reiss Romoli 274 IT - 10148 TORINO ITALY Tel: +39 011 228 5278 Fax: +39 011 228 5840 E-mail: Pietro.DiVita@tilab.com	
SC 86C/WG 1: Fibre optic communications systems and sub-systems	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=914	Convenor: Dr. Allen CHERIN Lucent Technologies 2000 Northeast Expressway US - NORCROSS, GA 30071 UNITED STATES OF AMERICA Tel: +1 770 798 2613 Fax: +1 770 798 4654 E-mail: acherin@lucent.com	

Organization	Web Homepage	Contact	Status/Notes
SC 86C/WG 3: Optical amplifiers	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1580	Convenor: Mr. Haruo OKAMURA Corning International K.K 1-14-14, Akasaka, Minato-ku Tokyo 107-0052 JAPAN Tel: +81 3 3586 1398 Fax: +81 3 3587 0906 E-mail: okamurah@corning.com	
SC 86C/WG 4: Discrete/Integrated optoelectronic semiconductor devices for fibre optic communication, including hybrid devices	http://www.iec.ch/cgi-bin/procgi.pl/www/iecwww.p?wwwlang=E&wwwprog=dirwg.p&ctnum=1653	Convenor: Dr. Tetsuhiko IKEGAMI NTT Advanced Technology Corporation 1-1-3, Crystal Park Bld. Gotenyama, Musashino-shi JP - TOKYO 180 JAPAN Tel: +81 422 48 5511 Fax: +81 422 48 7000 E-mail: ikegami@crystal.ntt-at.co.jp	
IETF - Internet Engineering Task Force			
IETF Sub-IP Area	http://www.ietf.org/html.charters/wg-dir.html#Sub-IP_Area	Area Director(s): Mr. Scott Bradner <sob@harvard.edu> Mr. Bert Wijnen <bwijnen@lucent.com>	
IETF Common Control and Measurement Plane (ccamp) Working Group (Sub-IP Area)	http://www.ietf.org/html.charters/ccamp-charter.html	Chair(s): Mr. Ron Bonica <ronald.p.bonica@wcom.com> Mr. Kireeti Kompella <kireeti@juniper.net>	

Organization	Web Homepage	Contact	Status/Notes
IETF IP over Optical (ipo) Working Group (Sub-IP Area)	http://www.ietf.org/html.charters/ipo-charter.html	Chair(s): Mr. James Luciani <james_luciani@mindspring.com> Mr. Daniel Awduche <awduche@movaz.com>	
IEEE - Institute of Electrical & Electronics Engineers		President: Joel B. Snyder Email: president@ieee.org	
IEEE 802 LAN/MAN Standards Committee	http://grouper.ieee.org/groups/802/index.html	Chair: Mr. Paul Nikolich E-mail: p.nikolich@ieee.org	
IEEE 802.3 CSMA/CD (ETHERNET) Working Group	http://grouper.ieee.org/groups/802/3/	Chair: Mr. Bob Grow E-mail: bob.grow@intel.com	
IEEE 802.3ae 10Gb/s Ethernet Task Force	http://grouper.ieee.org/groups/802/3/ae/index.html	Chair: Jonathan Thatcher E-mail: jonathan@worldwidepackets.com	
IEEE 802.17 Resilient Packet Ring Working Group	http://grouper.ieee.org/groups/802/17/	Chair: Mr. Mike Takefman E-mail: tak@cisco.com	
Optical Internetworking Forum (OIF) Technical Committee	http://www.oiforum.com/	Steve Joiner Ignis Optics Phone: (408) 869-8442 Fax: E-mail: steve.joiner@ignisoptics.com	
OIF Architecture Working Group		Chair: Jim Jones Alcatel USA 3400 W. Plano Pkwy. M/S - PB6- OLXDV Plano, TX 75075 TEL. 972-519-2744 Jim.D.Jones1@usa.alcatel.com	

Organization	Web Homepage	Contact	Status/Notes
OIF Carrier Working Group		Chair: John Strand AT&T Optical Networks Research Dept. Tel: +1 732 420 9036 Fax: +1 732 345 3036 E-mail: jls@research.att.com Temporary Address: 267 Cory Hall U. of California Berkeley, Ca. 94720 Tel. +1 510 642-9719 jls@photonics.eecs.berkeley.edu	
OIF OAM&P Working Group		Chair: Dr. Douglas N. Zuckerman Senior Research Scientist Telcordia Technologies, Inc. 331 Newman Springs Road Red Bank, NJ 07701 Tel: +1 732 758 5108 Fax: +1 732 758 4372 Email: w2xd@research.telcordia.com	
OIF Physical & Link Layer (PLL) Working Group		Chair: Mike Lerer Avici Systems Tel: +1 978 964 2058 Fax: +1 978 964 2100 E-mail: mlerer@avici.com	
OIF Signaling Working Group		Chair: Bala Rajagopalan Tellium Tel: +1 732 923 4237 Fax: +1 732 923 9804 E-mail: BRaja@tellium.com	

Organization	Web Homepage	Contact	Status/Notes
ATM Forum	http://www.atmforum.com/	President: Marlis Humphrey Harris Corporation 1025 W. NASA Blvd. Melbourne Beach, FL 32951 USA Phone:+1.321.727.9374 FAX: +1.321.727.9644 Email:mhumph03@harris.com	
Metro Ethernet Forum (MEF) Technical Committee	http://www.metroethernetforum.org/	Technical Committee Chairs: Mr. Paul Bottorff Nortel Networks, Inc. 4655 Great America Parkway, SC100-04 Santa Clara, CA 95054 USA Phone:+1.408-495-3365 Email:pbottorf@nortelnetworks.com Mr. Bob Klessig Cisco Systems, Inc 170 West Tasman Dr. San Jose, CA 95134 USA Phone: +1.408-853-5194 e-mail: bklessig@cisco.com	

7. Overview of existing standards and activity

With the rapid progress on standards and implementation agreements on OTNT, it is often difficult to find a complete list of the relevant new and revised documents. It is also sometimes difficult to find a concise representation of related documents across the different organizations that produce them. This section attempts to satisfy both of those objectives by providing concise tables of the relevant documents.

NOTE: Tables in this section include four digit ITU-T Recommendation numbers in the G. series. These new numbers are directly derived from the three digit versions with a “0” added after the three digit Recommendation number. The four digit numbers are created only in series where space is needed for new documents. The explanation for the current number extensions is captured in Annex C.

7.1 New or Revised OTNT Standards or Implementation Agreements

Many documents, at different stages of completion, address the different aspect of the OTNT space. The table below lists the known drafts and completed documents under revision that fit into this area. The table does not list all established documents which might be under review for slight changes or addition of features.

Three major families of documents (and more) are represented by fields in the following table, SDH/SONET, OTN Transport Plane, and ASON Control Plane. All of the recommendations and standards of these three different families are included in tables in later sections of this document.

TABLE 7-1/OTNT: OTNT Related Standards and Industry Agreements

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.3/4)	M.24otn	Error Performance Objectives and Procedures for Bringing-Into-Service and Maintenance of Optical Transport Networks	2003 target
ITU-T (Q.8/13)	G.optperf	Error and availability performance parameters and objectives for international paths within the Optical Transport Network (OTN)	2003 target
ITU-T (Q.10/13)	G.807/Y.1302	Requirements for Automatic Switched Transport Networks (ASTN)	07/2001
ITU-T (Q.2/15)	G.983.1	Broadband optical access systems based on Passive Optical Networks (PON)	10/1998
ITU-T (Q.2/15)	G.983.1 (corrig. 1)	Broadband optical access systems based on Passive Optical Networks (PON)	07/1999
ITU-T (Q.2/15)	G.983.1 (amend.1)	High speed optical access systems based on Passive Optical Network (PON) techniques	11/2001

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.2/15)	G.983.2	ONT management and control interface specification for ATM PON	06/2002 pre-publ.
ITU-T (Q.2/15)	G.983.3	A broadband optical access system with increased service capability by wavelength allocation	03/2001
ITU-T (Q.2/15)	G.983.4 (ex G.983.dba)	A Broadband Optical Access System with increased service capability using Dynamic Bandwidth Assignment	11/2001
ITU-T (Q.2/15)	G.983.5 (ex G.983.sur)	A Broadband Optical Access System with enhanced survivability	01/2002
ITU-T (Q.2/15)	G.983.6 (G.983.omci. sur)	ONT management and control interface specifications for B-PON system with protection features	06/2002
ITU-T (Q.2/15)	G.983.7 (G.983.omci. dba)	ONT management and control interface specification for dynamic bandwidth assignment (DBA) B-PON system	11/2001
ITU-T (Q.2/15)	G.983.8 (G.983.omci. ns)	ONT Management and Control Interface specification for ATM PON – Enhancements for new services	2003 target
ITU-T (Q.2/15)	G.984.1 (G.gpon.gsr)	Gigabit-capable Passive Optical Networks (GPON): Service requirements	2003 target
ITU-T (Q.2/15)	G.984.2 (G.gpon.pmd)	Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent layer specification	2003 target
ITU-T (Q.2/15)	G.984.3 (G.gpon.tc)	Gigabit-capable Passive Optical Networks (GPON): Transmission Convergence layer specification	2003 target
ITU-T (Q.2/15)	G.985 (G.ptp)	Point-to-Point optical access system	2003 target
ITU-T (Q.2/15)	G.gpon.omci	Gigabit-capable Passive Optical Networks (GPON): ONT Management and Control interface specification	2003 target
ITU-T (Q.9/15)	G.783	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	10/2000
ITU-T (Q.9/15)	G.783 (Amend. 1)	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	06/2002
ITU-T (Q.9/15)	G.783 (Amend. 2)	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks	2003 target

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
ITU-T (Q.9/15)	G.798	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	01/2002
ITU-T (Q.9/15)	G.798 (Amend.1)	Characteristics of Optical Transport Network Hierarchy Equipment Functional Blocks	06/2002
ITU-T (Q.9/15)	G.808.1	Generic protection switching - Linear trail and subnetwork protection	2003 target
ITU-T (Q.9/15)	G.841	Types and characteristics of SDH network protection architectures	10/1998
ITU-T (Q.9/15)	G.841 (Corrig. 1)	Types and characteristics of SDH network protection architectures	08/2002
ITU-T (Q.9/15)	G.842	Interworking of SDH network protection architectures	04/1997
ITU-T (Q.9/15)	G.873.1	Optical Transport network (OTN) - Linear Protection	2003 target
ITU-T (Q.11/15)	G.707/Y.1322	Network node interface for the synchronous digital hierarchy (SDH)	10/2000
ITU-T (Q.11/15)	G.707/Y.1322 (corrig. 1)	Network node interface for the synchronous digital hierarchy (SDH)	03/2001 pre-publ.
ITU-T (Q.11/15)	G.707/Y.1322 (Amend. 1)	Network node interface for the synchronous digital hierarchy (SDH)	11/2001
ITU-T (Q.11/15)	G.707/Y.1322 (corrig. 2)	Network node interface for the synchronous digital hierarchy (SDH)	11/2001
ITU-T (Q.11/15)	G.707/Y.1322 (Amend. 2)	Network node interface for the synchronous digital hierarchy (SDH)	08/2002
ITU-T (Q.11/15)	G.707/Y.1322 (Erratum 1)	Network node interface for the synchronous digital hierarchy (SDH)	09/2002 pre-publ.
ITU-T (Q.11/15)	G.707/Y.1322 (Amend. #3	Network node interface for the synchronous digital hierarchy (SDH)	2003 target
ITU-T (Q.11/15)	G.707/Y.1322 (Corrig. 3)	Network node interface for the synchronous digital hierarchy (SDH)	2003 target
ITU-T (Q.11/15)	G.709/Y.1331	Interfaces for the optical transport network (OTN)	02/2001
ITU-T (Q.11/15)	G.709/Y.1331 (addendum 1)	Interfaces for the optical transport network (OTN)	11/2001
ITU-T (Q.11/15)	G.7041/Y.1303 (g.gfp)	Generic framing procedure (GFP)	12/2001 pre-publ.

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.11/15)	G.7041/Y.1303 (Amend. 1)	Generic framing procedure (GFP)	06/2002
ITU-T (Q.11/15)	G.7041/Y.1303 (Amend.2)	Generic framing procedure (GFP)	2003 target
ITU-T (Q.11/15)	G.7041/Y.1303 (Corrig. 1)	Generic framing procedure (GFP)	2003 target
ITU-T (Q.11/15)	G.7042/Y.1305 (g.lcas)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	11/2001
ITU-T (Q.11/15)	G.7042/Y.1305 (Amend. 1)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	06/2002
ITU-T (Q.11/15)	G.7042/Y.1305 (Corrig. 1)	Link capacity adjustment scheme (LCAS) for virtual concatenated signals	2003 target
ITU-T (Q.12/15)	G.872	Architecture of optical transport networks	11/2001
ITU-T (Q.12/15)	G.8080/Y.1304 (g.ason)	Architecture for the Automatic Switched Optical Network	11/2001
ITU-T (Q.12/15)	G.ethna	Ethernet Layer Network Architecture	2003 target
ITU-T (Q.12/15)	G.eota	Ethernet over Transport Architecture	2003 target
ITU-T (Q.12/15)	G.esm	Ethernet over Transport - Ethernet Service Multiplexing	
ITU-T (Q.12/15)	G.ethsrv	Ethernet over Transport - Ethernet Service Characteristics	2003 target
ITU-T (Q.12/15)	G.smc	Service Management Channel - private line	
ITU-T (Q.13/15)	G.813	Timing Characteristics of SDH Equipment Slave Clocks (SEC)	08/96
ITU-T (Q.13/15)	G.8251 (g.otnjit)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	11/2001
ITU-T (Q.13/15)	G.8251 (Amend. 1)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	06/2002
ITU-T (Q.13/15)	G.8251 (corrig. 1)	The Control of Jitter and Wander within the Optical Transport Network (OTN)	06/2002
ITU-T (Q.14/15)	G.874	Management aspects of the optical transport network element	11/2001

Organisation (Subgroup responsible)	Number	Title	Public. Date
ITU-T (Q.14/15)	G.874.1	Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/2002
ITU-T (Q.14/15)	G.875	Optical transport network (OTN) management information model for the network element view	
ITU-T (Q.14/15)	G.7710/Y.1701 (g.cemr)	Common equipment management function requirements	11/2001
ITU-T (Q.14/15)	G.7713/Y.1704 (g.dcm)	Distributed call and connection management (DCM)	12/2001 pre-publ.
ITU-T (Q.14/15)	G.7713.1/Y.1704.1	Distributed Call and Connection Management – PNNI Implementation	2003 target
ITU-T (Q.14/15)	G.7713.2/Y.1704.2	Distributed Call and Connection Management – GMPLS RSVP-TE Implementation	2003 target
ITU-T (Q.14/15)	G.7713.3/Y.1704.3	Distributed Call and Connection Management – GMPLS CR-LDP Implementation	2003 target
ITU-T (Q.14/15)	G.7712/Y.1703 (g.dcn)	Architecture and specification of data communication network	11/2001
ITU-T (Q.14/15)	G.7714/Y.1705 (g.disc)	Generalized automatic discovery techniques	11/2001
ITU-T (Q.14/15)	G.7714.1/Y.1705.1	Protocol for automatic discovery in SDH and OTN networks	2003 target
ITU-T (Q.14/15)	G.7715/Y.1706 (g.rtg)	Architecture and requirements for routing in automatically switched optical networks	06/2002
ITU-T (Q.14/15)	G.7716/Y.1707 (g.lcs)	[ASTN link connection status]	
ITU-T (Q.14/15)	G.7717/Y.1708 (g.cac)	[common access control]	
ITU-T (Q.15/15)	G.650.1	Definitions and test methods for linear, deterministic attributes of single-mode fibre and cable	06/2002
ITU-T (Q.15/15)	G.650.2	Definitions and test methods for statistical and non-linear attributes of single-mode fibre and cable	06/2002
ITU-T (Q.15/15)	G.652	Characteristics of a single-mode optical fibre cable	10/2000

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
ITU-T (Q.15/15)	G.653	Characteristics of a dispersion-shifted single-mode optical fibre cable	10/2000
ITU-T (Q.15/15)	G.654	Characteristics of a cut-off shifted single-mode optical fibre cable	06/2002
ITU-T (Q.15/15)	G.655	Characteristics of a non-zero dispersion shifted single-mode optical fibre cable	10/2000
ITU-T (Q.16/15)	G.691	Optical interfaces for single channel STM-64, STM-256 systems and other SDH systems with optical amplifiers	10/2000
ITU-T (Q.16/15)	G.692	Optical interfaces for multichannel systems with optical amplifiers	10/1998
ITU-T (Q.16/15)	G.692 (Corrig. 1)	Optical interfaces for multichannel systems with optical amplifiers – Corrigendum [referencing G.694.1 for frequency grid]	06/2002
ITU-T (Q.16/15)	G.693 (g.vsr)	Optical interfaces for intra-office systems	11/2001
ITU-T (Q.16/15)	G.694.1 (g.wdm.1)	Spectral grids for WDM applications: DWDM frequency grid	06/2002
ITU-T (Q.16/15)	G.694.2 (G.wdm.2)	Spectral grids for WDM applications: CWDM wavelength grid	06/2002
ITU-T (Q.16/15)	G.959.1	Optical transport network physical layer interfaces	02/2001
ITU-T (Q.16/15)	G.695(G.cap p)	Optical interfaces for Coarse Wavelength Division Multiplexing applications	2003
ITU-T (Q.16/15)	Sup.dsn	Optical system design and engineering considerations	2003
ITU-T (Q.17/15)	G.671	Transmission characteristics of optical components and subsystems	06/2002 pre publ.
IETF (ccamp)	Draft-ietf-mpls-generalized-signaling-09.txt	Generalized MPLS - Signaling Functional Description	
IETF (ccamp)	Draft-ietf-mpls-generalized-cr-ldp-07.txt	Generalized MPLS Signaling - CR-LDP Extensions	

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
IETF (ccamp)	Draft-ietf-mpls-generalized-rsvp-te-09.txt	Generalized MPLS Signaling - RSVP-TE Extensions	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-sonet-sdh-07.txt	Generalized Multiprotocol Label Switching Extensions for SONET and SDH Control	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-architecture-03.txt	Generalized Multi-Protocol Label Switching (GMPLS) Architecture	
IETF (ccamp)	Draft-ietf-ccamp-lmp-07.txt	Link Management Protocol (LMP)	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-routing-05.txt	Routing Extensions in Support of Generalized MPLS	
IETF (ccamp)	Draft-ietf-ccamp-ospf-gmpls-extensions-09.txt	OSPF Extensions in Support of Generalized MPLS	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-sonet-sdh-extensions-03.txt	Generalized Multiprotocol Label Switching Extensions to Control Non-Standard SONET and SDH Features	
IETF (ccamp)	Draft-ietf-ccamp-lmp-mib-04.txt	Link Management Protocol Management Information Base	
IETF (ccamp)	Draft-ietf-ccamp-lmp-wdm-01.txt	Link Management Protocol (LMP) for DWDM Optical Line Systems	
IETF (ccamp)	Draft-ietf-ccamp-sdhsonet-control-01.txt	Framework for GMPLS-based Control of SDH/SONET Networks	

Organisation (Subgroup responsible)	**Number**	**Title**	**Public. Date**
IETF (ccamp)	Draft-ietf-ccamp-gmpls-signaling-survey-03.txt	Generalized MPLS Signaling - Implementation Survey	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-g709-03.txt	Generalized MPLS Signalling Extensions for G.709 Optical Transport Networks Control	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-tc-mib-00.txt	Definition of Textual Conventions and OBJECT-IDENTITIES for Generalized Multiprotocol Label Switching (GMPLS) Management	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-te-mib-00.txt	Generalized Multiprotocol Label Switching (GMPLS) Traffic Engineering Management Information Base	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-lsr-mib-00.txt	Generalized Multiprotocol Label Switching (GMPLS) Label Switch Router Management Information Base	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-recovery-terminology-01.txt	Recovery (Protection and Restoration) Terminology for GMPLS	
IETF (ccamp)	Draft-ietf-ccamp-tracereq-00.txt	Tracing Requirements for Generic Tunnels	
IETF (ccamp)	Draft-ietf-ccamp-lmp-test-sonet-sdh-00.txt	SONET/SDH Encoding for Link Management Protocol (LMP) Test messages	
IETF (ccamp)	Draft-ietf-ccamp-gmpls-overlay-00.txt	GMPLS RSVP Support for the Overlay Model	

Organisation (Subgroup responsible)	Number	Title	Public. Date
IETF (ccamp)	Draft-ietf-ccamp-gmpls-recovery-analysis-00.txt	Analysis of Generalized MPLS-based Recovery Mechanisms (including Protection and Restoration)	
IETF (ipo)	Draft-ietf-ipo-impairments-04.txt	Impairments And Other Constraints On Optical Layer Routing	
IETF (ipo)	Draft-ietf-ipo-framework-03.txt	IP over Optical Networks: A Framework	
IETF (ipo)	Draft-ietf-ipo-carrier-requirements-05.txt	Carrier Optical Services Requirements	
IEEE (802.3)		[1Gb LAN PHY]	
IEEE (802.3)		[10Gb LAN PHY]	
IEEE (802.3)		[10Gb WAN PHY]	
IEEE (802.17)		[Resilient Packet Ring]	
OIF	OIF-UNI-01.0	User Network Interface (UNI) 1.0 Signaling Specification	Now available
OIF	OIF-CDR-01.0	Call Detail Records for OIF UNI 1.0 Billing	Now available
OIF	OIF-VSR4-01.0	Very Short Reach (VSR) OC-192 Interface for Parallel Optics	Now available
OIF	OIF-VSR4-02.0	Serial OC-192 1310nm Very Short Reach (VSR) Interfaces	Now available
OIF	OIF-VSR4-03.0	Very Short Reach (VSR) OC-192 Four Fiber Interface Based on Parallel Optics	Now available
OIF	OIF-VSR4-04.0	Serial Shortwave Very Short Reach (VSR) OC-192 Interface for Multimode Fiber	Now available
OIF	OIF-VSR4-05.0	Very Short Reach (VSR) OC-192 Interface Using 1310 Wavelength and 4 and 11 dB Link Budgets	Now available

Organisation (Subgroup responsible)	Number	Title	Public. Date
OIF	OIF-VSR5-01.0	Very Short Reach Interface Level 5 (VSR-5): SONET/SDH OC-768 Interface for Very Short Reach (VSR) Applications	Now available

7.2 SDH & SONET Related Recommendations and Standards

The following table lists all the known documents specifically related to SDH and SONET.

TABLE 7-2/OTNT: SDH & SONET Recommendations & Industry Standards

{PRIVATE}	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
Internet Document Source	http://www.itu.int/publications/itut.htm	http://www.etsi.org/getastandard/home.htm	http://www.atis.org/atis/docstore/index.asp
Physical Interfaces	G.703 (10/98) G.957 (06/99) G.692 (10/98) K.41 (05/98) G.691 (04/00)	ETS 300 166 ETS 300 232, ETS 300 232(A1) ETS 300 166 (09/99)	T1.102-1993 (R1999) T1.105.06-1996 T1.416-1999 T1.416.01-1999 T1.416.02-1999 T1.416.03-1999
Network Architecture	G.805 (11/95), (03/00) G.803 (06/97), (03/00) I.322 (02/99)	ETR 114	T1.105.04-1995 (R2001)
Structures & Mappings	G.704 (10/98) G.707 (10/00) corrig. 1 & 2, amendment 1 G.7041 (10/01) GFP G.7042 (10/01) LCAS G.708 (10/98) G.832 (10/98)	ETS 300 167 (08/93), (09/99) ETS 300 147 Ed.3 ETS 300 337 Ed.2	T1.105-2001 T1.105.02-2001
Equipment Functional Characteristics	G.664 (06/99) G.781 (06/99) G.783 (10/00) corr. G.958 (01/94) G.705 (04/00) G.806 (04/0)	EN 300 417-x-y (x=1-7,9 y=1-2) ETS 300 635 ETS 300 785 RE/TM-1042-x-1 (x=1-5) MI/TM-4048 (9712)	-
Laser Safety	G.664 (06/99)	-	-
Transmission Protection	G.841 (10/98), Corrig. 1 (08/02) G.842 (04/97) G.808.1 (2003) M.2102 (03/00)	ETS 300 746 ETS 300 417-1-1 ETS 300 417-3-1 ETS 300 417-4-1 TS 101 009 TS 101 010 RE/TM-1042 TR/TM-03070	T1.105.01-2001
Equipment	M.3100 Amendment	-	-

{PRIVATE}	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
Protection			
Restoration	-	DTR/TM-3076	-
Equipment Management	G.784 (06/99)	EN 301 167 EN 300 417-7-1 DE/TM-2210-3	-
Management Communications Interfaces	-		T1.105.04-1995 (R2001)
Information Model	G.773 (03/93) G.774 (09/92), Corr.1(11/96), (04/00) G.774.01 (11/94), Corr1(11/96), (04/00) G.774.02 (11/94), Corr1(11/96), (04/00) G.774.03 (11/94), Corr1(11/96), (04/00) G.774.04 (07/95), Corr1(11/96), (04/00) G.774.05 (07/95), Corr1(11/96), (04/00) G.774.06 (04/00) G.774.07 (11/96), (04/00) G.774.08 (04/00) G.774.09 (04/00) G.774.10 (04/00)	ETS 300 304 Ed.2 ETS 300 484 ETS 300 413 ETS 300 411 ETS 300 493 prEN 301 155	T1.119-1994 (R2001) T1.119.01-1995 (R2001) T1.119.02-1998 T1.245-1997
Network Management	G.831 (08/96), (03/97) T.50 (09/92) G.85x.y (11/96)	ETS 300 810	T1.204-1997
Error Performance [network level view]	G.826 (02/99) G.827 (02/00) G.827.1 (11/00) G.828 (02/00) G.829 (02/00) M.2101 (02/00) M.2101.1 (04/97) M.2102 (02/00) M.2110 (04/97) M.2120 (04/97), (02/00) M.2130 (02/00) M.2140 (02/00)	EN 301 167	T1.105.05-1994 T1.514-2001
Error Performance [equipment level view]	G.783 (10/00) corr. G.784 (06/99)	EN 300 417-x-1 RE/TM-1042	-
Jitter & Wander Performance	G.813 (08/96) G.822 (1988) G.823 (03/93), (03/00) G.824 (03/93), (03/00) G.825 (03/93), (02/99) G.783 (10/00), corr. O.171 (04/97)	EN 300 462-5-1 EN 302 084 (01/99) DEN/TM-1079 (05/98)	T1.105.03-1994 T1.105.03a-1995 T1.105.03b-1997

{PRIVATE}	ITU-T Published or Draft (Revised) Recommendation	Published or Draft (Revised) ETS or EN	Published or Draft (Revised) ATIS/ANSI T1
	O.172 (03/99), (06/98)		
Components & Subsystems	-	-	-
Leased Lines	M.13sdh (02/00)	EN 301 164 EN 301 165	-
Synchronisation [Clocks & Network Architecture]	G.803 (06/97), (02/99) G.810 (08/96) G.811 (09/97) G.812 (06/98) G.813 (08/96)	EN 300 462-1 EN 300 462-2 EN 300 462-3 EN 300 462-4 EN 300 462-5 EN 300 462-6 EN 300 417-6-1 DEG/TM-01080 (03/99)	T1.101-1999 T1.105.09-1996 (R2002)
Test signals	O.150 O.181	-	-
Environment	-	ETS 300 019-1-0 ETS 300 019-1-1 ETS 300 019-1-2 ETS 300 019-1-3 ETS 300 019-1-3 A1 ETS 300 019-2-0 ETS 300 019-2-1 ETS 300 019-2-2 ETS 300 019-2-3 ETS 300 019-2-3 A1	-
Digital Video	-	ETS 300 814 TR 101 200	-
Power & Grounding	-	ETS 300 132-2 ETS 300 132-2 C1 ETS 300 253	-
Physical Design	-	ETS 300 119-1 ETS 300 119-3 ETS 300 119-4	-
EMC	-	ETS 300 386-1 EN 300 386-2 ETS 300 753	-

7.3 ITU-T Recommendations on the OTN Transport Plane

The following table lists all of the known ITU-T Recommendations specifically related to the OTN Transport Plane.

TABLE 7-3/OTNT: ITU-T Recommendations on the OTN Transport Plane

{PRIVATE}Topic	Title	Publ.*
Framework for Recommendations	**G.871/Y.1301** Framework for Optical Transport Network Recommendations	10/00

{PRIVATE}Topic	Title	Publ.*
Architectural Aspects	**G.872** Architecture of Optical Transport Networks (Published, 02/99)	
	G.872 Architecture of Optical Transport Networks (Revised, 11/01 pre-publ.)	11/01
	G.872 Living List (version 06/01)	
Control Plane	ASTN/ASON recommendations are moved to specific ASTN/ASON standards page.	
Structures & Mapping	**G.709/Y.1331** Network node interface for the optical transport network (OTN)	02/01
	G.709/Y.1331 Addendum 1	11/01
	G.709 Living List	
	G.975 Forward Error Correction	10/00
Functional Characteristics	**G.681** Functional characteristics of interoffice long-haul line systems using optical amplifiers, including optical multiplexing	10/96
	G.798 Characteristics of optical transport network (OTN) equipment functional blocks	11/01
	G.798 Amendment 1	06/02
	G.798 Living List	
	G.806 Characteristics of transport equipment - Description Methodology and Generic Functionality	10/00
	G.7710/Y.1701 Common Equipment Management Requirements	11/01
Protection Switching		
	G.808.1 (G.gps) Generic protection switching - Linear trail and subnetwork protection	2003
	G.873.1 Optical Transport network (OTN) - Linear Protection	2003
Management Aspects	**G.874** Management aspects of the optical transport network element	11/01
	G.874.1 Optical Transport Network (OTN) Protocol-Neutral Management Information Model For The Network Element View	01/02
	G.875 Optical Transport Network (OTN) management information model for the network element view	
Data Communication Network (DCN)	**G.7712/Y.1703** Architecture and specification of data communication network	11/01
	G.dcn living list	
Error Performance	**G.optperf** Error and availability performance parameters and objectives for international paths within the Optical Transport Network (OTN)	2003
	G.optperf living list	
	M.24otn Error Performance Objectives and Procedures for Bringing-Into-Service and Maintenance of Optical Transport Networks	2003
Jitter & Wander Performance	**G.8251(G.otnjit)** The control of jitter and wander within the optical transport network (OTN)	11/01
	G.8251 Amendment 1 The control of jitter and wander within the optical transport network (OTN)	06/02
	G.8251 Corrigendum 1 The control of jitter and wander within the optical transport network (OTN)	06/02
Physical-Layer Aspects	**G.691** Optical Interfaces for single-channel SDH systems with Optical Amplifiers, and STM-64 and STM-256 systems	10/00

{PRIVATE}Topic	Title	Publ.*
	G.692 Optical Interfaces for Multichannel Systems with Optical Amplifiers	10/98
	G.694.1 Spectral grids for WDM applications: DWDM frequency grid	06/02
	G.694.2 Spectral grids for WDM applications: CWDM wavelength grid	06/02
	G.664 General Automatic Power Shut-Down Procedures for Optical Transport Systems	06/99
	G.959.1 Optical Transport Networking Physical Layer Interfaces	02/01
	G.693 Optical interfaces for intra-office systems	11/01
	Sup.dsn Optical System Design	2003
Fibres	**G.651** Characteristics of a 50/125 um multipmode graded index optical fibre cable	02/98
	G.652 Characteristics of a single-mode optical fibre cable	10/00
	G.653 Characteristics of a dispersion-shifted single mode optical fibre cable	10/00
	G.654 Characteristics of a cut-off shifted single-mode fibre cable	06/02
	G.655 Characteristics of a non-zero dispersion shifted single-mode optical fibre cable	10/00
Components & Sub-systems	**G.661** Definition and test methods for the relevant generic parameters of optical amplifier devices and subsystems	10/98
	G.662 Generic characteristics of optical fibre amplifier devices and subsystems	10/98
	G.663 Application related aspects of optical fibre amplifier devices and sub-systems	04/00
	G.671 Transmission characteristics of passive optical components	06/02

*Note: Dates with year only are expected publication dates. Those with month and date are actual pre-published document availability dates or final publication dates.

7.4 ITU-T Recommendations on the ASTN/ASON Control Plane

The following table lists all of the known ITU-T Recommendations specifically related to the ASTN/ASON Control Plane.

TABLE 7-4/OTNT: ITU-T Recommendations on the ASTN/ASON Control Plane

{PRIVATE}Topic	Title	Publ.*
Requirements	**G.807/Y.1302** Requirements for the Automatic Switched Transport Network (ASTN)	07/01
Architecture	**G.8080/Y.1304** Architecture for the Automatic Switched Optical Network (ASON)	11/01
	G.ason living list	
Protocol Neutral Specifications for key signalling elements	**G.7713/Y.1704** Generalised Distributed Connection Management	10/01
	G.7713.1/Y.1704 Distributed Call and Connection Management – PNNI Implementation	2003
	G.7713.2/Y.1704 Distributed Call and Connection Management – GMPLS RSVP-TE Implementation	2003

{PRIVATE}**Topic**	**Title**	**Publ.***
	G.7713.3/Y.1704 Distributed Call and Connection Management – GMPLS CR-LDP Implementation	2003
	G.7714/Y.1705 Generalised automatic discovery techniques	10/01
	G.7714.1/Y.1705.1 Protocol for automatic discovery in SDH and OTN networks	2003
	G.7715/Y.1706 Architecture and requirements for routing in automatically switched optical networks	06/02
	G.7716/Y.1707 [ASTN link connection status]	
	G.7717/Y.1708 [Connection Admission Control]	
Specific Protocols to realise the signalling elements	. .	
Data Communication Network (DCN)	**G. 7712/Y.1703** Data Communication Network	10/01
	G.dcn living list	

*Note: Dates with year only are expected publication dates. Those with month and date are actual pre-published document availability dates or final publication dates.

8. Overview of existing holes/overlaps/conflicts

Considering the number and diversity of different organizations working on standardising aspects of OTNT, it is inevitable that some areas will be missed. For the same reasons, some aspects will be addressed in multiple groups, resulting in possible conflicts based on different applications, priorities, or technical expertise. These items need to be identified and addressed as appropriate. The following table lists those that have been identified, the recommended action, and the status of that action.

TABLE 8-1/OTNT: Known OTNT Standardization Holes/Overlaps/Conflicts

No.	Issue	Action	Status
1.	NNI requirements documents being developed in the IETF ccamp and ipo working groups in parallel with the ITU-T work on G.807/Y.1302, G.8080, and many other drafts.	Formal communications, Cross-pollination by company representatives	Ongoing collaboration by company representatives
2.	Parallel work by ITU-T on permanent virtual circuit based on NNI with work at IETF work on both switch service based on optical UNI and permanent virtual connections based on optical NNI		Ongoing collaboration by company representatives
3.	10GbE WAN PHY may not interoperate with interfaces developed using STM-64 specifications	Adaptation in draft revision of G.707	CLOSED
4.	IEEE 802.3 Ethernet in the First Mile Study Group addressing work that should utilise Q.2/15 work on physical layer portions of Passive Optical Networks	Communication Statement sent to IEEE 802.3, Q.2/15 selected liaison to help coordinate work	Under study in Q.2/15
5	Metropolitan optical networks being developed independent of established standard interfaces, assuming they are stand-alone networks	Metro optical networks description included in OTNT SWP	CLOSED

6	IaDI standardization has different concepts among the different questions. What is necessary? Is the difference in opinion simply based on different interpretations of the IaDI definition?	Work proposals and discussion in Q.16/15 on IaDI standardization	Under study in Q.16/15
7	OTN Routing and how to deal with physical impairments on logical routing decisions	Proposals reviewed in Q.14/15	Under study in Q.14/15
8	Optical Supervisory Channel (OSC) has slightly different definitions and views of standardization among the different questions. What is necessary?	Proposals considered by Q.12/15 and Q.16/15	Inactive
9	Ethernet (GbE, 10GbE) is supported as a client of the OTN, but is additional standardization required specific to Ethernet?	Liaisons to and from the MEF	Q.12/15 continues work on Transport of Ethernet
10	OTN and ASON Framework Recommendations have been proposed in discussions. G.871 is valid (but out of date) as a framework for OTN. The new Optical Transport Networks & Technology Standardization/Work Plan will provide frequently updated information. Are framework recommendations necessary?	Options considered in Q.19/15	Inactive
11	Optical transport network terminology is inconsistent across the industry and in some cases even across the ITU-T. What about using G.871 as the holder for normative definitions for OTN?	Draft document of optical technology terminology based on G.780, G.872, and G.709 provided by Q.9/15	Q.19/15 working via correspondence between SG15 meetings
12	Characterisation of optical monitoring parameters, which would be required for all-optical networking, remain undefined. Which parameters should be used at an all-optical measurement point, how should they be measured, and how should they be used?	Draft G.optmon being considered in Q.16/15	Under study in Q.16/15 and Q.3/4
13	Multiple ITU-T SG15 questions have discussed the standardization of OTN GCC contents. Is coordination between the questions required?	NO, each group standardize the application within its scope	CLOSED
14	Optical control plane protocols to support ASON are currently being discussed, revised, or defined in several organizations, including ITU-T SG15, the IETF, the OIF, and the ATM Forum.	Formal communications, Cross-pollination by company representatives	Ongoing collaboration by company representatives
15	GFP being considered for multiple applications not fully addressed by the current standardized version. Enhancements for different applications either need to be included in G.7041 or they will likely be captured in other application specific documents, resulting in multiple “versions” of GFP.	Q.2/15 considering modified GFP for PON applications	Coordination between Q.2, 11, and 12/15 required

Annex A - Terminology Mapping

The terminology used by different organizations working on similar or overlapping technical areas of standardization has complicated attempts to co-ordinate work between different groups. The same terms are often used, with different meanings by multiple organizations. Readers are warned to verify the definitions before assuming a common understanding of the terms. Specific appendices have been included in ITU-T Recommendations G.7713.x to assist the reader in mapping signalling protocol terminology used in those document to the similar terms used in other well know references.

Annex B - Other OTNT Related Organizations

Organizations not recognized by the ITU-T are also working to develop industry agreements in the area of optical networking. The following table lists them and the relevant contact information.

Organization	**Web Homepage**	**Contact**	**Status/Notes**
Network and Services Integration Forum (NSIF)	http://www.atis.org/atis/sif/sifhom.htm	Kenneth Stephens BellSouth USA Tel. +1 205-977-7195 kenneth.stephens2@bridge.bellsouth.com	Inactive

Annex C - Re-numbering of ITU-T Recommendations

In order to have more room for numbering, new Recommendations falling within the G.700-G.709; G.770-G.779; G.800-G.809; G.820-G.829 series will be numbered with a fourth digit, e.g. new Recommendation G.ason was numbered as G.8080. Documents approved before this change (10/01) retain the three digit numbers.

____

IEEE P802.3 Maintenance

March 10th, 2003
DFW Airport, TX

David Law

Maintenance Requests Status

- 109 Maintenance requests
- 3 new Maintenance requests since November
- Current status -

Balloting (IEEE P802.3aj)	24
Awaiting clarification	1
Errata	1
To be categorised	3
Review by Technical experts	0
Withdrawn	7
Published	70

IEEE P802.3aj Maintenance #7

- IEEE P802.3aj PAR approved by NesCom
  - Approved 13th June 2002
- Working Group Ballot
  - WG Ballot opened 25th November 2002
  - WG Ballot Closed 2nd January 2003
- Met at January Interim in Vancouver for Comment resolution

IEEE P802.3aj Maintenance #7 Working Group Ballot Status

- Ballot status as of 24th February 2003:
  - Response Ratio (> 50%): 115/218 = 52.8%
  - Abstention Ratio (< 30%): See next page
  - Approval Ratio (> 75%): See next page
- Comments received: 31
  - 10 Technical Required
  - 7 Technical
  - 14 Editorial

Revision Request number	Voters	Ballots returned	Approve	Approve with comments	Disapprove	Abstain	Return rate	Approval rate	Abstain rate	Re-circulation
1004	218	115	95	1	0	19	52.8%	100.0%	16.5%	Y
1035	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1037	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1064	218	115	94	2	0	19	52.8%	100.0%	16.5%	Y
1068	218	115	95	1	0	19	52.8%	100.0%	16.5%	N
1078	218	115	92	2	1	20	52.8%	98.9%	17.4%	Y
1079	218	115	93	3	0	19	52.8%	100.0%	16.5%	Y
1080	218	115	89	4	1	21	52.8%	98.9%	18.3%	Y
1083	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1085	218	115	94	2	0	19	52.8%	100.0%	16.5%	Y
1086	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1087	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1088	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1089	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1090	218	115	92	3	0	20	52.8%	100.0%	17.4%	Y
1091	218	115	94	2	0	19	52.8%	100.0%	16.5%	Y
1092	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1095	218	115	94	2	0	19	52.8%	100.0%	16.5%	Y
1096	218	115	96	0	0	19	52.8%	100.0%	16.5%	N
1097	218	115	91	3	0	21	52.8%	100.0%	18.3%	Y
1098	218	115	95	1	0	19	52.8%	100.0%	16.5%	N
1099	218	115	95	1	0	19	52.8%	100.0%	16.5%	N
1103	218	115	95	0	0	19	52.8%	100.0%	16.5%	N
1104	218	115	95	0	0	19	52.8%	100.0%	16.5%	N

IEEE P802.3aj Maintenance #7

- Now in Working Group Recirculation Ballot
  - Ballot Opened 24th February
  - Ballot Closes 11th March
- PAR Update
  - Clarification that the scope is 802.3-2002 and 802.3ae

Plans for the week

- Maintenance committee meeting this week
  - Maintenance Requests
    - Review status of existing revision requests
    - Classify new revision requests
  - IEEE P802.3aj Maintenance #7
    - Comment resolution from D2.1
    - Charter editor to produce new draft
    - Prepare for Sponsor Ballot (dependent on ballot)

Maintenance Web Information

- The Maintenance web site is at:

  http://www.ieee802.org/3/maint/index.html

- The Maintenance request form is available at:

  http://www.ieee802.org/3
  /private/maint/revision_request.html

  Username: **802.3**

  Password: *******

  Password **is** case sensitive

IEEE P802.3 Maintenance

March 13th, 2003

DFW Airport, TX

David Law

Activities this week

- Met Wednesday afternoon
  - Reviewed open Maintenance Requests
    - 3 New requests
  - IEEE P802.3aj/D2.1 ballot
    - Comment resolution
    - Chartered editor to produced D3.0

New IEEE Std. 802.3ae Request

An issue with the frequency of the square-wave pattern used for measuring OMA in the IEEE802.3ae

Standard specifies the pattern for measuring OMA to be from four to eleven same consecutive bits, followed by the inversion of the same. This arbitrariness (4 to 11) results in variability of the OMA measurement result depending on the nr. of bits chosen, increasing the uncertainty of many measurements done on the standard. A remedy is proposed.

The text of the IEEE 802.3ae and of D5.0 (both 2002)

52.9.1.2 Square wave pattern definition
A pattern consisting of four to eleven consecutive ones followed by an equal run of zeros may be used as a square wave. These patterns have fundamental frequencies between approximately 452 MHz (10GBASEW) and 1289 MHz (10GBASE-R).

Corresponding text is in the section 49.2.8, describing the implementation of the PCS pattern generator:

49.2.8 Test pattern generators
…..

IEEE P802.3aj Maintenance #7 Working Group Ballot Status

- Ballot status (D2.1 Recirculation):
  - Response Ratio (> 50%): 125/218 = 57.3%
  - Abstention Ratio (< 30%): See next page
  - Approval Ratio (> 75%): See next page
- Comments received: 11
  - 1 Technical Required
  - 0 Technical
  - 10 Editorial

IEEE P802.3aj Comments

Bit(s)	Name	Description	R/W	Default
6.15:7 ~~5~~	Reserved	Write as zero, ignore on read	RO	0
6.6	Receive Next Page Location Able	1 = Received Next Page storage location is specified by bit (6.5) 0 = Received Next Page storage location is not specified by bit (6.5)	RO	1
6.5	Received Next Page Storage Location	1 = Link Partner Next Pages are stored in Register 8 0 = Link Partner Next Pages are stored in Register 5	RO	0

Bit(s)	Name	Description	R/W	Default
6.15:7 ~~5~~	Reserved	Write as zero, ignore on read	RO	0
6.6	Receive Next Page Location Able	1 = Received Next Page storage location is specified by bit (6.5) 0 = Received Next Page storage location is not specified by bit (6.5)	RO	
6.5	Received Next Page Storage Location	1 = Link Partner Next Pages are stored in Register 8 0 = Link Partner Next Pages are stored in Register 5	RO	

Revision Request number	Voters	Ballots returned	Approve	Approve with comments	Disapprove	Abstain	Return rate	Approval rate	Abstain rate	Re-circulation
1004	218	125	99	1	0	25	57.3%	100.0%	20.0%	N
1035	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1037	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1064	218	125	98	2	0	25	57.3%	100.0%	20.0%	N
1068	218	125	99	1	0	25	57.3%	100.0%	20.0%	N
1078	218	125	97	2	0	26	57.3%	100.0%	20.8%	N
1079	218	125	97	3	0	25	57.3%	100.0%	20.0%	N
1080	218	125	93	5	0	27	57.3%	100.0%	21.6%	N
1083	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1085	218	125	98	2	0	25	57.3%	100.0%	20.0%	N
1086	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1087	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1088	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1089	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1090	218	125	96	3	0	26	57.3%	100.0%	20.8%	N
1091	218	125	98	2	0	25	57.3%	100.0%	20.0%	N
1092	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1095	218	125	98	2	0	25	57.3%	100.0%	20.0%	N
1096	218	125	100	0	0	25	57.3%	100.0%	20.0%	N
1097	218	125	95	3	0	27	57.3%	100.0%	21.6%	N
1098	218	125	99	1	0	25	57.3%	100.0%	20.0%	N
1099	218	125	99	1	0	25	57.3%	100.0%	20.0%	N
1103	218	125	99	0	0	25	57.3%	100.0%	20.0%	N
1104	218	125	99	0	0	25	57.3%	100.0%	20.0%	N

IEEE 802.3 Motion

IEEE 802.3 accepts the resolution to all comments received in the Working Group recirculation ballot of P802.3aj Draft 2.1, and authorises the editor to generate Draft 3.0.

IEEE 802.3 requests that the P802 LMSC Executive Committee forwards IEEE P802.3aj Draft D3.0 for LMSC Sponsor Ballot.

IEEE 802.3 authorises the IEEE P802.3aj Task Force to conduct meetings and recirculation ballots as necessary to resolve comments received during the LMSC Sponsor Ballot.

M: D. Law S: H. Barrass Tech 75%/~~Proc 50%~~

PASSED/~~FAILED~~ Date: 13-Mar-2003

Y: 62 N: 0 A: 2

Maintenance Web Information

- The Maintenance web site is at:

  http://www.ieee802.org/3/maint/index.html

- The Maintenance request form is available at:

  http://www.ieee802.org/3 /private/maint/revision_request.html

  Username: **802.3**
  Password: *********
  Password **is** case sensitive

To: Mr. Peter Wery
ITU-T SG 15

To: Mr. Mark Jones
ITU-T SG Q19/15

Cc: Mr. Paolo Rosa
ITU-T TSB

Subject: Comments on COM 15 – R 40 – E

Dear Mr. Wery and Mr. Jones,

Thank you for inviting IEEE 802 to submit comments on your document, ITU-T COM 15 – R 40 – E, OTN - Standardization and Work Plan (issue 3).

We have noted that the phrase "Ethernet over Transport" has been used in some contexts. We would like to point out that Ethernet is defined entirely by IEEE P802.3 and an alternate wording such as “802.3 Frames over Transport” is suggested. We request that we be given the opportunity to review any proposals for the description of “802.3 Frames over Transport”.

In section 6.1, page 25, the contacts listed for IEEE should be modified as follows.

IEEE - Institute of Electrical & Electronics Engineers		President: Michael Adler Email: president@ieee.org
IEEE Standards Association	http://standards.ieee.org	Chair: Mr. Gerald Peterson E-mail: ghpeterson@ieee.org
IEEE 802 LAN/MAN Standards Committee	http://grouper.ieee.org/groups/802/index.html	Chair: Mr. Paul Nikolich E-mail: p.nikolich@ieee.org
IEEE 802.3 CSMA/CD (ETHERNET) Working Group	http://grouper.ieee.org/groups/802/3/	Chair: Mr. Bob Grow E-mail: bob.grow@intel.com
IEEE 802.3ah Ethernet in the First Mile Task Force	http://grouper.ieee.org/groups/802/3/efm/	Chair: Howard Frazier E-mail: millardo@dominetsystems.com
IEEE 802.17 Resilient Packet Ring Working Group	http://grouper.ieee.org/groups/802/17/	Chair: Mr. Mike Takefman E-mail: tak@cisco.com

In section 7.1, page 36, the documents listed for IEEE should be modified as follows.

IEEE 802.3	IEEE 802.3-2002	All published standards from the 802.3 WG, including Gigabit and 10 Gigabit Ethernet
IEEE 802.3ah	Draft	The 802.3ah Task Force Draft
IEEE 802.17	Draft	The 802.17 Working Group Draft

Please note that in the 802.3ah and 802.17 drafts are in development and are therefore available only to Working Group members or other standards bodies at the discretion of the Chair of the relevant Working Group.

Thank you.

Sincerely,
Paul Nikolich
Chair IEEE 802

IEEE 802.3
Interpretations Report

March 10th, 2003
DFW Airport, TX

David Law

Interpretations Status

- 6 new Interpretations received

  1-03/03 - Vertical eye closure penalty

  2-03/03 - Pause priority resolution

  3-03/03 - Twisted-pair model

  4-03/03 - 1000BASE-T Test Fixtures

  5-03/03 - 1BASE5 Isolation

  6-03/03 - 10Mb/s and 100Mb/s Repeaters

- 1 Interpretations outstanding from November

  4-11/02 - Link Aggregation Control Protocol

- Available on Interpretations area of web site
  - Hard copies for those interested

Interpretations Status

- 1 Interpretation response in ballot

  2-11/02 - 10Mb/s and 100Mb/s Carrier Detect

  – Approved for working Group ballot in July
    - Working ballot opened October 8, 2001
  – Ballot closes Midnight PST tomorrow

Interpretation 2-11/02 D1.0 Working Group ballot (Summary @10th March 22:30 CST)

219	Voters
70	Ballots returned
32.0%	**Return rate (> 50% required)**
48	Approval
2	Disapprove
20	Abstain
96.0%	**Approval rate (> 75% required)**
28.6%	**Abstain rate (< 30% required)**

Comments:

2	Technical Required
3	Technical
1	Editorial

IEEE P802.3 Interpretation 2-11/02 Working Group ballot

If you have not already voted

PLEASE VOTE

Remember

- 802.3 Voters are obligated to participate in the ballot in order to retain their voting membership

Plans for the week

- Close the 2-11/02 Working Group ballot
- Meet this week
  - Review interpretation request and draft response
- Present response to Closing 802.3 Plenary
  - Three way vote
    - Approve proposed response
    - Reject proposed response
    - Send proposed response out for Working Group Ballot

TIA-TR42 Liaison

Engineering Committee on User Premises Telecommunications Cabling Infrastructure

March 2003,
Dallas, TX

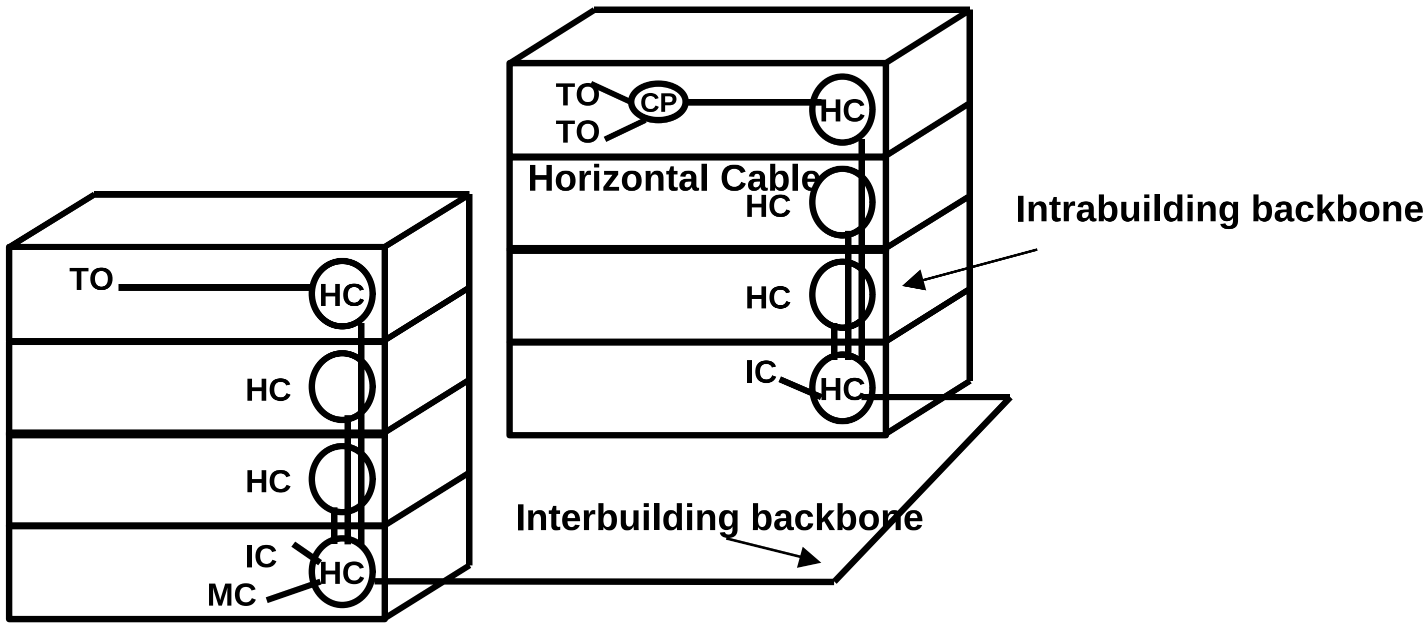
Chris Di Minico
MC Communications
cdiminico@ieee.org

TR-42 - Commercial Building Telecommunications Standards

TR-42 - TIA/EIA-568-A ------> TIA/EIA-568-B - Cabling Standard

Performance and technical criteria for a telecommunication cabling system

- Topology, and Components



TR-42.3 - Commercial Building Telecommunications Pathways and Spaces

•TIA/EIA -569 - Pathways and Spaces

TR42.1 Study Group: Telecommunications Cabling Infrastructure for Network Distribution Nodes

Scope: Develop cabling topology, recognized media types, cabling requirements, and requirements for pathways & spaces for data centers

- Cabling Design
- Network Design
- Facility Design

Project Status TR42-1.1: Data Center Standard

PN-3-0092

Telecommunications Infrastructure Standard
for Data Centers
Draft 1.0
January 30, 2003

- **We have a project number and a first draft**

Design Elements:

Cabling Design:

- copper and fiber cabling performance
- connectors, cables, distribution hardware
- cabling distances
- space management

Facility Design:

- Data center sizing
- Power distribution methodologies
- Pathways and spaces
- HVAC, security, operations, and administration.
- Flexibility, scalability, reliability and space management

Design Elements:

Network Design:

•support legacy systems

•enable rapid deployment of new technologies such as the emerging 10 Gb/s applications.

Overview of key elements - Normative

Normative:

–**Clause 5.** cabling spaces - definitions

–**Clause 6.** Data center cabling
   –definitions
   –topology
   –recognized media
   –redundancy

–**Clause 7.** Data Center Cabling Pathways

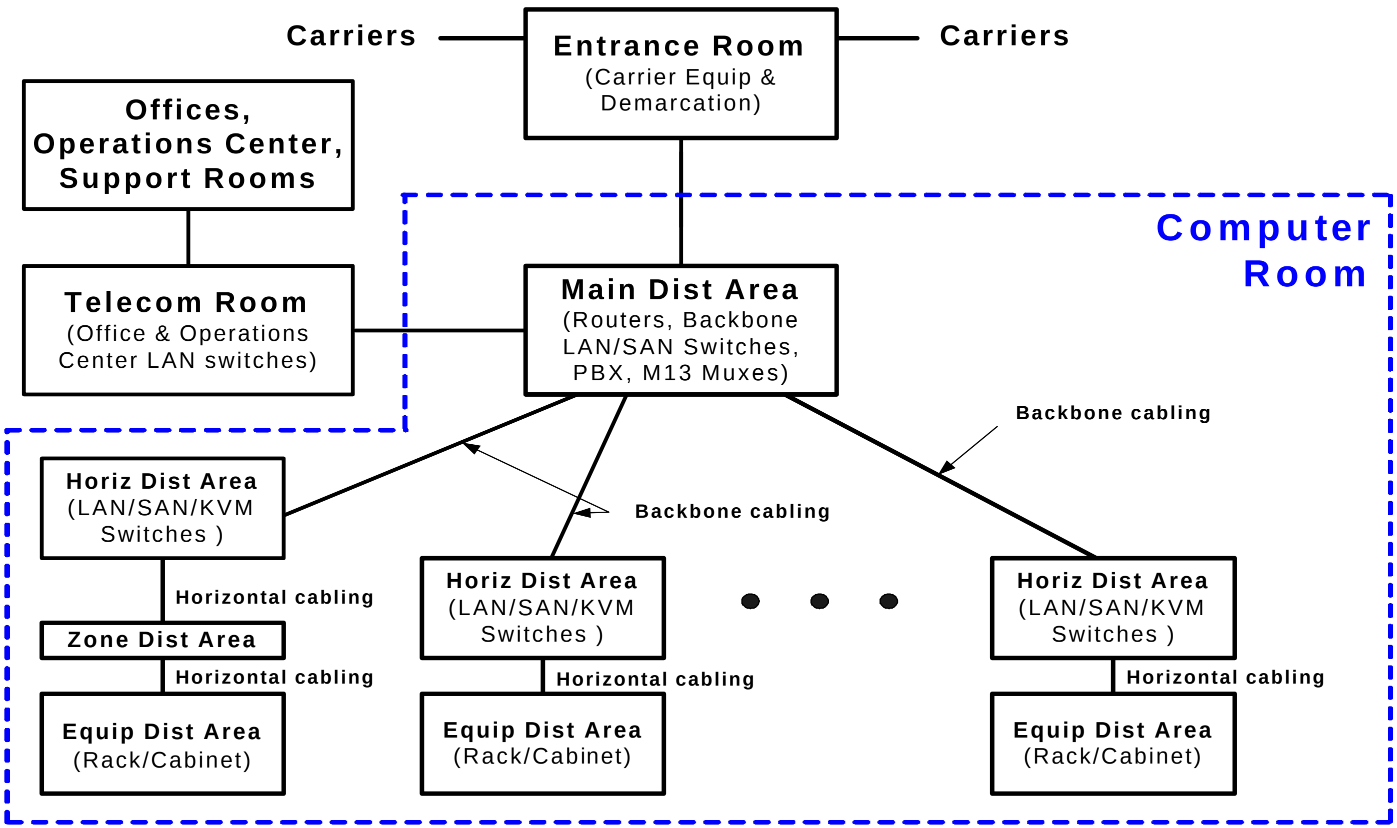
Overview of key elements - Informative

<u>Informative:</u>

- **Clause 8:** Redundancy

- **Annex:**
  - –application distances
  - –administration
  - –carrier information
  - –site selection
  - –infrastructure tiering
  - –design examples

Example of basic data center topology



- Collapsed
- multiple entrance rooms

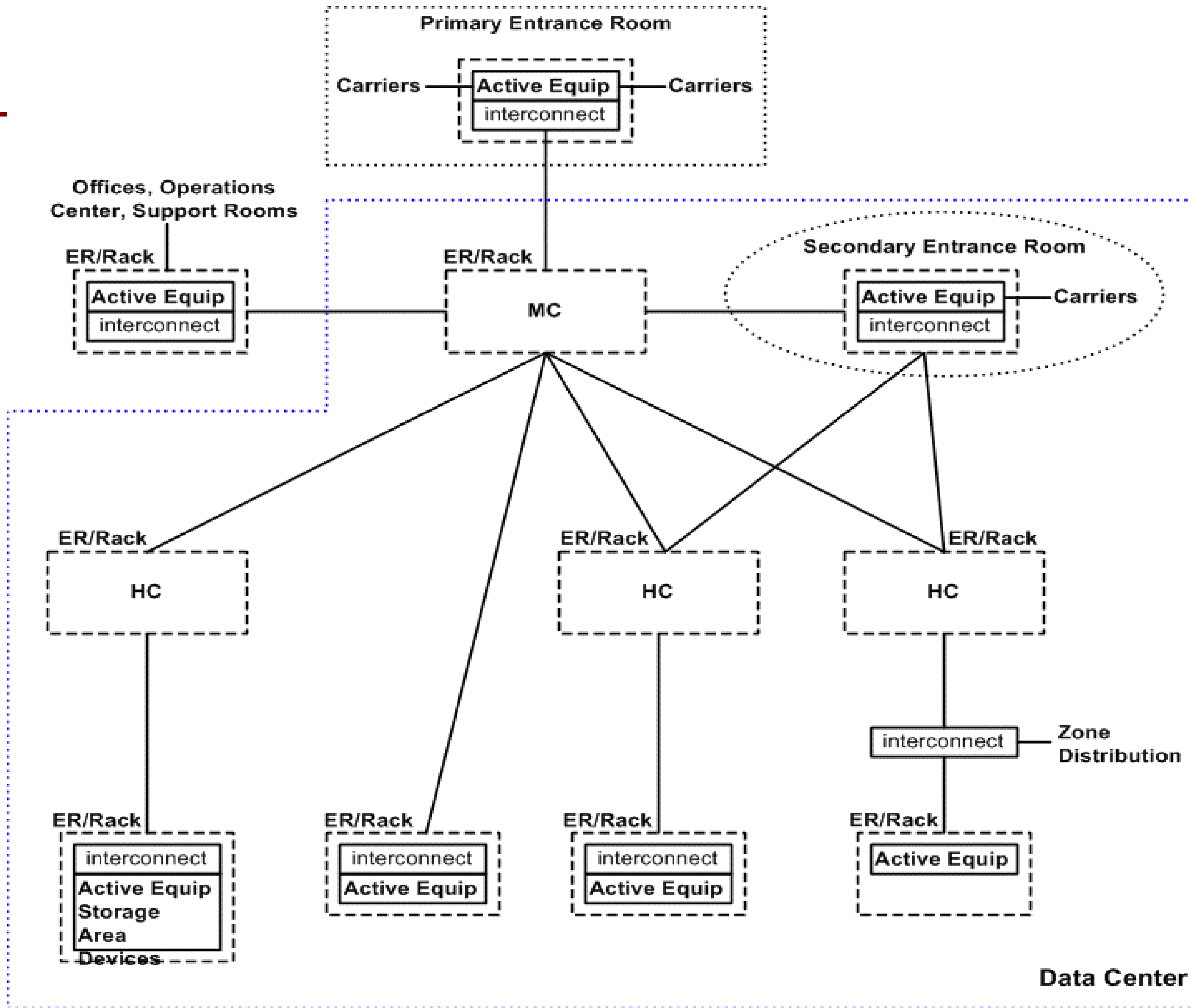
Distribution Areas - Spaces for cabling elements

Cabling elements

•cross-connect
•interconnect

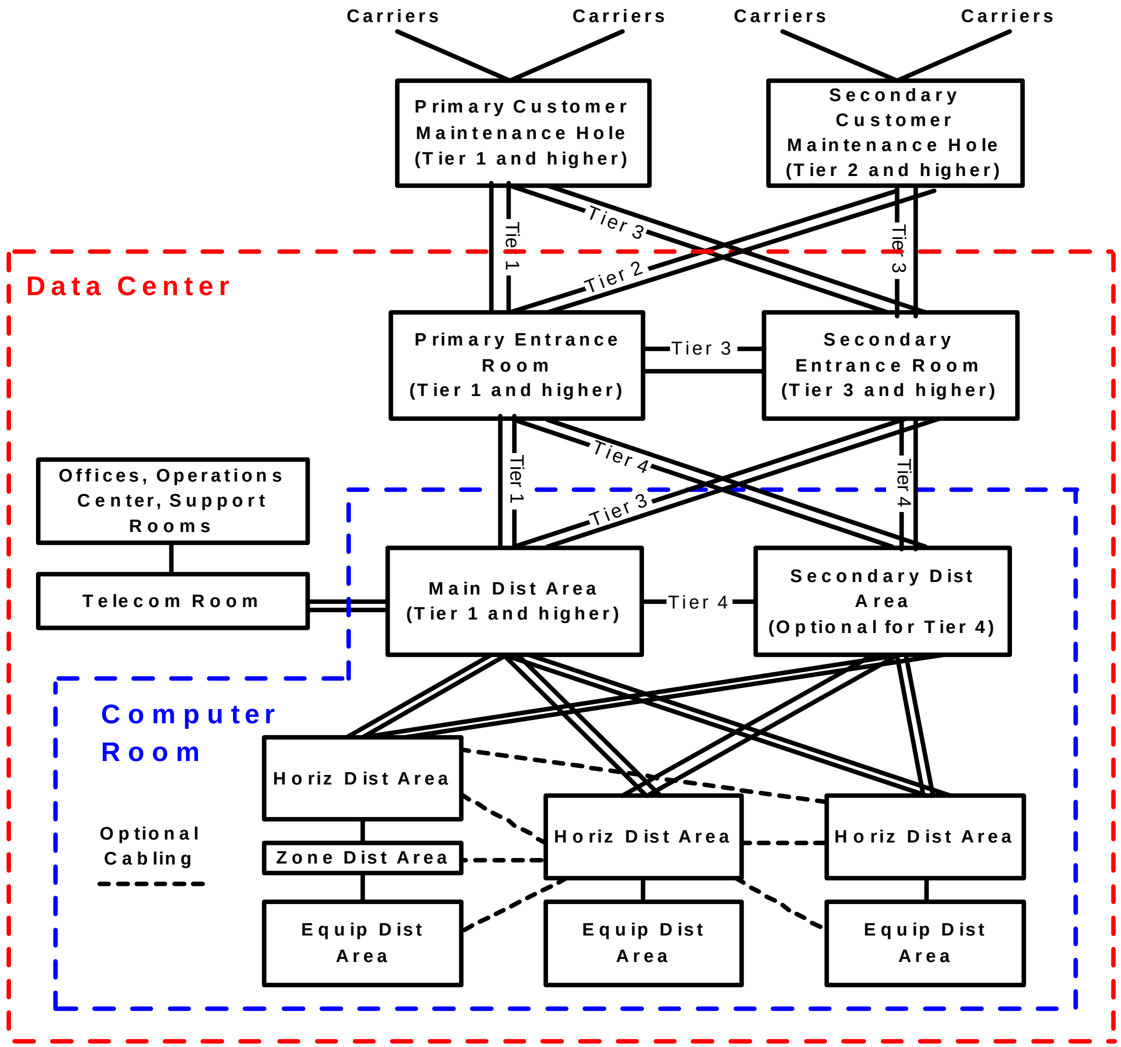
Distribution Areas

•Main Distribution Area -MDA
•Horizontal Distribution Area -HDA
•Zone Distribution Area - ZDA
•Equipment Distribution Area -EDA
•Entrance Room



Primary Entrance Room
Carriers
Active Equip
interconnect
Carriers
Offices, Operations
Center, Support Rooms
ER/Rack
Active Equip
interconnect
ER/Rack
MC
Secondary Entrance Room
Active Equip
interconnect
Carriers
ER/Rack
HC
ER/Rack
HC
ER/Rack
HC
interconnect
Zone
Distribution
ER/Rack
interconnect
Active Equip
Storage
Area
Devices
ER/Rack
interconnect
Active Equip
ER/Rack
interconnect
Active Equip
ER/Rack
Active Equip
Data Center

Data center redundancy



TR-42- Copper and Fiber Cabling Work Groups

- **Addendum: 802.3af DTE Power**

- **Liaison Letter: EFM fiber (extended temperature)**

TR42.9 Industrial Telecommunications Infrastructure

Scope: Developing standards for telecommunications infrastructure in industrial buildings. Addressing environmental conditions such as extreme temperature, EMI/RFI, corrosion, ands hazardous gasses.

PAR FORM

PAR Status: Amendment of Standard (Unapproved PAR)
PAR Approval Date: 0000-00-00
PAR Signature Page on File: Yes
Review of Standards Development Process: No

1. Assigned Project Number: 802.3ak

2. Sponsor Date of Request: 2003-02-03

3. Type of Document: Standard for

4. Title of Document:
Draft: Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Physical Layer and Management Parameters for 10 Gb/s Operation, Type 10GBASE-CX4

5. Life Cycle: Full Use

6. Type of Project:
6a. Is this an update to an existing PAR? No

6b. The Project is a: Amendment to Std 802.3-2002 and 802.3ae-2002

7. Contact Information of Working Group:
Name of Working Group: 802.3
Name of Working Group Chair: Robert M Grow
Telephone: 858-391-4622 **FAX:** 858-391-4659
Email: bob.grow@ieee.org

8. Contact Information of Official Reporter (If different than Working Group Chair)
Name of Official Reporter: (if different than WG contact)
Telephone: FAX:
Email:

9. Contact Information of Sponsoring Society or Standards Coordinating Committee:
Name of Sponsoring Society and Committee: Computer Society Local and Metropolitan Area Networks
Name of Sponsoring Committee Chair: Paul Nikolich
Telephone: 857-205-0050 **FAX:** 781-334-2255
Email: p.nikolich@ieee.org
Name of Liaison Rep. (If different than Sponsor Chair):
Telephone: FAX:
Email:

10. The Type of ballot is: Individual Sponsor Ballot
Expected Date of Submission for Initial Sponsor Ballot: 2003-11-21

11. Fill in Projected Completion Date for Submittal to RevCom: 2004-03-24
Explanation for Revised PAR that Completion date is being extended past the original four-year life of the PAR:

12. Scope of Proposed Project:

The scope of this project is to specify additions to and appropriate modifications of IEEE Std 802.3 as amended by IEEE Std 802.3ae-2002 (and any other approved amendment or corrigendum) to add a copper Physical Medium Dependent (PMD) option for 10 Gb/s operation, building upon the existing 10GBASE-X Physical Coding Sublayer (PCS) and 10 Gigabit Attachment Unit Interface (XAUI) specifications.

13. Purpose of Proposed Project:

The purpose of this project is to provide a lower-cost option for interconnection of closely located equipment (within ~15m of cable), typically within a stack or between equipment racks within a room.

14. Intellectual Property:

Sponsor has reviewed the IEEE patent policy with the working group? Yes
Sponsor is aware of copyrights relevant to this project? No
Sponsor is aware of trademarks relevant to this project? No
Sponsor is aware of possible registration of objects or numbers due to this project? Yes

15. Are you aware of other standards or projects with a similar scope? No

Similar Scope Project Information:

16. Is there potential for this standard (in part or in whole) to be submitted to an international organization for review/adoption?: Yes

If yes, please answer the following questions:

Which International Organization/Committee? IEC TCJTC1 SC6 WG3

International Contact Information?	Robin Tasker CLRC +44-1925-603758 R.Tasker@dl.ac.uk

17. Will this project focus on Health, Safety or Environmental Issues? No

18. Additional Explanatory Notes: (Item Number and Explanation)

10GBASE-CX4

5 Criteria

Broad Market Potential

Broad set(s) of applications
Multiple vendors, multiple users
Balanced cost, LAN Vs. attached stations

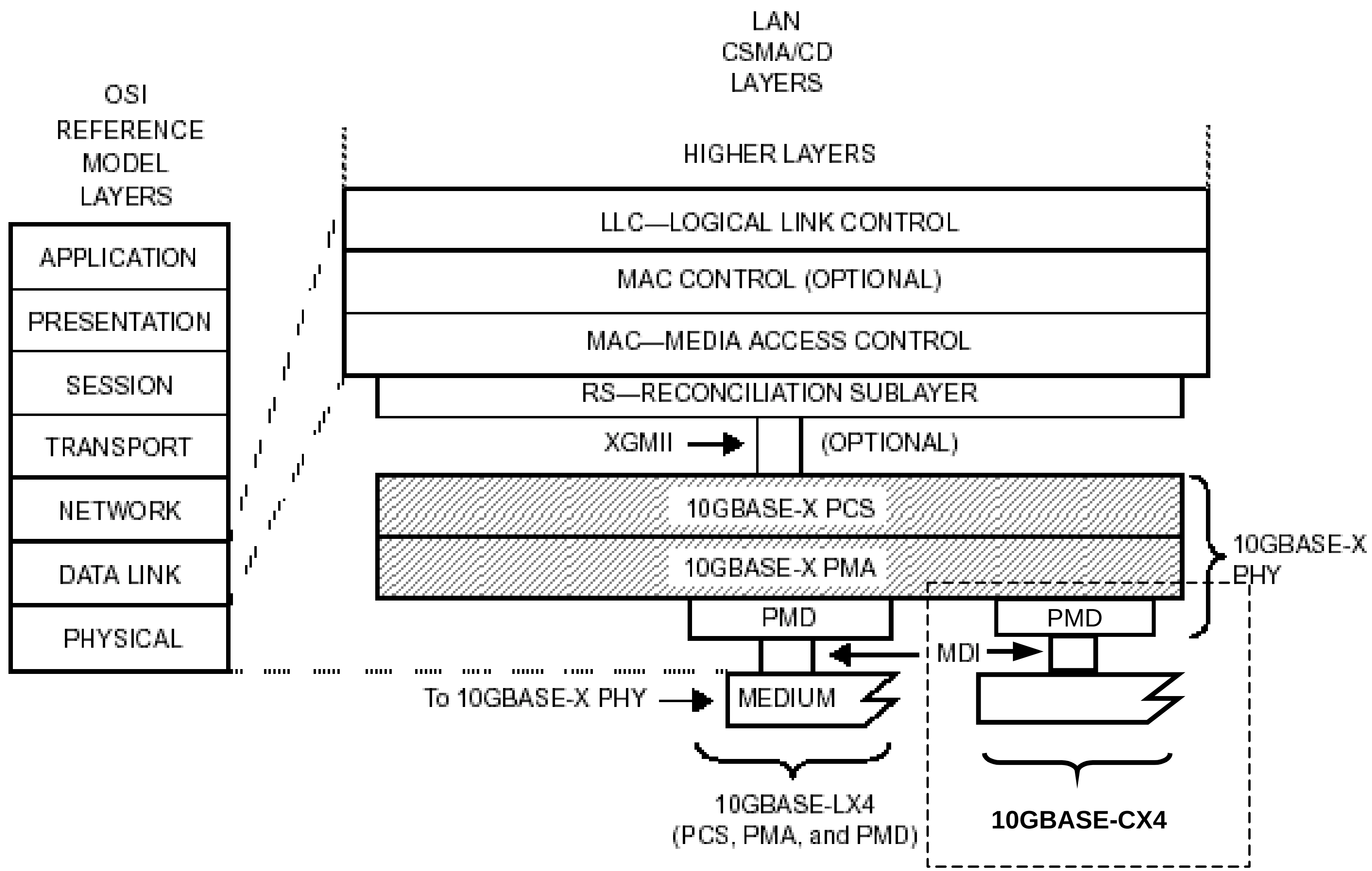
- **As customers move to 1000BASE-T attached desktops, the demand for a very low-cost 10Gbps link to interconnect switches gains demand. 10GBASE-CX4 meets that demand.**
- **A 10 Gb/s 802.3 copper PMD solution extends Ethernet capabilities providing higher bandwidth for multimedia, distributed processing, imaging, medical, CAD/CAM, and pre-press applications by lowering the cost of high performance 10Gbps network links for:**
  - **LAN Backbone, server and gateways in Data Centers**
  - **Switch aggregation**
  - **Storage Area Network (SAN)**
- **average of 35 participants per meeting from more than 30 companies have attended 3 10-Gigabit Copper study group meetings and indicate that they plan to participate in the standardization of 10GBASE-CX4**
- **This level of commitment indicates that a standard will be supported by a large group of vendors. This in turn will ensure that there will be a wide variety of equipment supporting a multitude of applications.**
- **10GBASE-CX4 helps bring a cost sensitive solution to this performance space.**
- **10GBASE-CX4 improves the cost balance for short-reach attached stations at 10Gbps.**

Compatibility with IEEE Std 802.3

Conformance with CSMA/ CD MAC, PLS
Conformance with 802.2
Conformance with 802

- **The proposed standard will conform to the full-duplex operating mode of the 802.3 MAC, at 10 Gb/ s operation.**
- **As was the case in previous 802.3 standards, a new physical layer will be defined for 10 Gb/s operation.**
- **The proposed standard will conform to the 802.3 MAC Client Interface, which supports 802.2 LLC.**
- **The proposed standard will conform to the 802.1 Architecture, Management and Interworking.**
- **The proposed standard will define systems management which is compatible with OSI and SNMP system management standards.**

Compatibility with IEEE Std 802.3



MDI=MEDIUM DEPENDENT INTERFACE
PCS=PHYSICAL CODING SUBLAYER
PHY=PHYSICAL LAYER DEVICE

PMA=PHYSICAL MEDIUM ATTACHMENT
PMD=PHYSICAL MEDIUM DEPENDENT
XGMII=10GIGABIT MEDIA INDEPENDENT INTERFACE

Distinct Identity

Substantially different from other 802.3 specs/ solutions
Unique solution for problem (not two alternatives/ problem)
Easy for document reader to select relevant spec

- **The current 802.3 10Gb/s specification includes only fiber-optic media types for interconnection of devices. There are no copper media types .**
- **The specification will be done in a format consistent with the IEEE document requirements thus making it easy for implementers to understand and design to.**
- **The proposed specification will use copper media similar to other high speed networking technologies (FibreChannel, IB4X) but does so with the IEEE 802.3 MAC as the over-riding layer which will result in higher compatibility and lower cost for 10Gbps Ethernet systems.**

Technical Feasibility

Demonstrated feasibility; simulations, reports - - working models
Proven technology, reasonable testing
Confidence in reliability

- **Technical presentations, given to 802.3, have demonstrated the feasibility of using the copper media in useful network topologies at a rate of 10 Gb/s.**
  Other technologies like IB-4X and 10GFC are deployed with similar media and baud rates.
- **The principle of extending higher speeds to copper media has been well established by previous work within 802.3. The 10 Gb/s work will build on this experience.**
- **Vendors of XAUI components and systems are building reliable products which operate at 10 Gb/s on copper media, and meet worldwide regulatory and operational requirements.**
- **Component vendors have presented research on the feasibility of physical layer signaling at a rate of 10 Gb/s on copper media using a wide variety of innovative low cost technologies.**

Economic Feasibility

Cost factors known, reliable data
Reasonable cost for performance expected
Total Installation costs considered

- **Cost factors are extrapolated from the XAUI component supplier base and technology curves.**
- **Cost for a copper 10GBASE-CX4 implementation is expected to be 1/20 to 1/10 that of 10GBASE-optical solutions.**
- **Costs for assemblies based on established standards (IB4X,10GFC) are well known and reasonable.**
- **Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.**